2

ARI RESEARCH NOTE 79-19

LEVEL II

MCDONNELL DOUGLAS
CORPORATION

ARI RESEARCH NOTE 79-19

SELECTION AND TRAINING OF FIELD ARTILLERY FORWARD OBSERVERS: METHODOLOGIES FOR IMPROVING TARGET ACQUISITION SKILLS

J.B. Mocharnuk, R.A. Marco and D.S. Trelz
McDonnell Douglas Astronautics Company-St. Louis
and
R.O. Waldkoetter and J.R. Milligan
Army Research Institute for the Behavioral and Social Sciences

Submitted by:
R.M. Chambers, Chief
ARI FIELD UNIT AT FORT SILL, OKLAHOMA

Approved By:

E. Ralph Dusek
PERSONNEL AND TRAINING
RESEARCH LABORATORY

Joseph Zeidner
TECHNICAL DIRECTOR

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
5001 Eisenhower Avenue, Alexandria, Virginia

Office, Deputy Chief of Staff for Personnel
Department of the Army

July 1979

Army Project Number
2Q263731A768
2Q263731A770

Contract Forward Observer Skills
DAHC 19-78-C-0025

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. ~~REPORT NUMBER~~ 14 RN-79-19 18 ARI
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER
4. ~~TITLE (and Subtitle)~~ 6 Selection and Training of Field Artillery Forward Observers: Methodologies for Improving Target Acquisition Skills
5. ~~TYPE OF REPORT & PERIOD COVERED~~ 9 Technical Rep[redacted]t, 1 Jul[redacted]'78 [redacted] 31 Jul[redacted]79
6. ~~PERFORMING ORG. REPORT NUMBER~~
7. ~~AUTHOR(s)~~ 10 John B. Mocharnuk, Ruth Ann Marco, Dawn S. Trelz, [redacted] Raymond O. Waldkoetter [redacted] John R. Milligan [redacted]
8. CONTRACT OR GRANT NUMBER(s) 15 DAHC19-78-C-0025
9. ~~PERFORMING ORGANIZATION NAME AND ADDRESS~~ McDonnell Douglas Astronautics Co.-St. Louis Div. P.O. Box 516 St. Louis, MO 63166
10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 16 2Q263731A768, 2Q263731A770
11. CONTROLLING OFFICE NAME AND ADDRESS Deputy Chief of Staff for Personnel Washington, DC 20310
12. ~~REPORT DATE~~ 11 Jul[redacted]79
13. ~~NUMBER OF PAGES~~ 330
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Army Research Institute for the Behavioral and Social Sciences, Alexandria, VA 22333
15. SECURITY CLASS. (of this report) UNCLASSIFIED
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Unclassified, Distribution Unlimited 12 354 p.
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)
18. SUPPLEMENTARY NOTES Monitoring of this research and utilization of overall resources was supervised by Randall M. Chambers, Chief, Ft. Sill Field Unit, P.O. Box 33066, Ft. Sill, OK 73503
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Task Analysis	Personnel Selection	Task Selection Algorithm
Training Analysis	Task Classification	Combat Scenario
Profile Development	Location Skills	Course Evaluation
Forward Observer	Validation	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Research was performed to identify prominent characteristics of Field Artillery forward observer (FO) selection and training which can be used to improve basic performance of FO tasks and thereby enhance the combat effectiveness of the fire support system.

The methodology incorporated profile development, task analysis, and training analysis. These research elements were supported by data obtained from → next page

DD FORM 1 JAN 73 1473 404 237 UNCLASSIFIED

20. ABSTRACT (Cont'd)

1.) interviews with instructors and over 50 FOs or Fire Support Team (FIST) chiefs, 2.) two questionnaires administered to Field Artillery Officer Basic Course (FAOBC) students, and 3.) a questionnaire completed by 332 artillery officers.

The profile development activity examined critical characteristics, abilities, and personal histories of successful FOs; the task analysis identified the essential skills and knowledges needed in the FO combat role; and the training analysis reviewed the effectiveness of current FO training content, procedures, and techniques. The most important findings from the profile development activity were that those who demonstrate skill in basic map reading and navigation perform better, math aptitude is important for successful FO performance, and effective interaction of the FO with the maneuver unit is critical if the fire support mission is to be properly brought to fruition.

The task analysis clearly showed that map reading skills were among the most critical FO skills. Task by scenario interactions were found to be an important consideration in determining FO tasks and skill requirements. The training analysis revealed discrepancies in the list of tasks taught in FAOBC and the list of tasks emerging from the task analysis and identified alternative approaches. Methodology and procedures were suggested for increasing the effectiveness of FO and OBC training development.

FOREWORD

The U.S. Army Field Artillery School and TRADOC pursue a continuing program of weapon system effectiveness analyses. Within the weapon system context there is a vital need to understand what effects the human operator or crewman may produce when utilizing a given weapon system. Both the personnel selection and assignment of key Artillery personnel are of primary interest as well as determining which individual skills should receive training development and evaluation.

From the July 1977 operational start of the Fort Sill Field Unit there were several questions regarding the forward observer's (FO) function in maximizing the use of related weapon systems. Since the FO training and the Officer's Basic Course essentially have the same key critical objectives and requirements, the research findings are applicable to each training perspective.

Results from this effort provide methodological approaches for improving skills as well as performing similar personnel, task and training analyses. Select .e accession of FO's may not be wholly permissible, yet personnel input through ROTC and self motivation can be encouraged based on the indications of the "FO Profile" concept and equations predicting successful performance. Also by applying the diagnostic value of the results, additional constructive steps are to be suggested for remedial training or reinforcement of important skills during training and unit activities.

Besides having direct training implications and methodological uses, certain cost effectiveness gains can result when improved personnel utilization is achieved and weapon system effectiveness is enhanced. With in-house effort exerted and augmented research support from McDonnell Douglas Corporation under contract DAHC 19-78-C-0025, an intensive set of analyses give a thorough review and evaluation of FO target acquisition skills at the individual and fire support team (FIST) levels. This advanced developmental research was done under Army Projects 2Q263731A768 and 2Q263731A770 to satisfy requirements for Manpower Accession and Retention Systems and Performance-Oriented Skill Development and Evaluation.

JOSEPH ZEIDNER
Technical Director

ACKNOWLEDGEMENTS

Many individuals helped in this effort by freely discussing Forward Observer issues and by completing questionnaires, participating in interviews, or by assisting in the data collection process. We are grateful to all of those individuals who contributed to this project. The authors wish to acknowledge the contributions of the following individuals who gave a little extra to the effort.

U.S. Army Field Artillery School: Mr. Anthony, CPT Burke, CPT Cochenour, CPT French, Mr. Hampton, CPT Hickock, CPT Kinder, CPT Kinkaid, MAJ Mainord, LTC Patrick, CPT Rizzoni, MAJ Taylor, MAJ Wallace.
1st Infantry Division Artillery: CPT Mitchel
2nd Armor Division Artillery: LTC White
9th Infantry Division: COL Myatt

Special thanks is due Brigadier General Edward A. Dinges who delivered great assistance by providing a cover letter for the Forward Observer Questionnaire. With this assistance we were able to obtain an unusually high questionnaire return rate.

Major Wayne Chamberlain and his supporting personnel in the registrar's office repeatedly went out of their way to assist in providing research data while insuring that the personal privacy of every student was protected.

Major Donald A. Nemetz, the ARI R&D Coordinator at Fort Sill provided outstanding assistance in several phases of this research. His help ranged from discussion of research issues to paving the way for smooth and efficient technical interchanges with military personnel both at Fort Sill and other installations.

Mr. William J. Edens of McDonnell Douglas Automation Company provided invaluable assistance in conducting the statistical analyses used in the profile development and test validation components of this research. His familiarity with statistical packages and sensitivity to important subtleties in the data led to a more efficient development of a Forward Observer profile.

Sincere thanks are extended to Dr. Randall M. Chambers, U.S. Army Research Institute (Fort Sill Field Unit) and Mr. James G. Curtin and Dr. Edward R. Jones of McDonnell Douglas Astronautics Company for the guidance and management support provided during the performance of this research.

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

LIST OF FIGURES

LIST OF FIGURES (Cont'd)

LIST OF TABLES

LIST OF TABLES (Cont'd)

LIST OF TABLES (Cont'd)

LIST OF TABLES (Cont'd)

EXECUTIVE SUMMARY

Background

The U.S. Army Field Artillery School at Ft. Sill, Oklahoma is charged with the responsibility of training artillery officers in all facets of artillery system performance. One component of this system is the location of enemy targets and subsequent destruction of these targets through direction of fire by an observer located in a forward position in the combat zone, usually remote from the artillery pieces. The accuracy and rapidity with which the forward observer (FO) is able to perform these tasks have a direct bearing on the outcome of the battlefield situation, i.e., whether enemy targets are destroyed or disabled. Recent advances in battlefield weapons technology and enemy mobility have made the role of the FO even more critical. Serious concern has been expressed regarding the selection of personnel who are best suited to perform these tasks and the requisite training neccessary to increase the efficiency and effectiveness of the combat artillery unit.

In general, artillery forward observers are performing below acceptable levels as defined by the Army Training and Evaluation Programs (ARTEP). In some cases, performance has deviated from the standard to the point that combat effectiveness may be severely impaired. In order to help upgrade the performance of the FO, and thereby improve the effectiveness of the field artillery combat arm, increased emphasis must be placed on the selection and training of qualified FOs who demonstrate competence on combat-referenced operational performance measures. This can be achieved by analyzing forward observer tasks, developing a profile of the effective forward observer, and specifying the correspondence between this profile and valid performance criteria.

This research was performed to identify salient features of FO personnel selection and training which might improve basic FO task performance and thereby enhance the combat effectiveness of the Field Artillery system. This document explicates that research and delineates potential applications of the findings.

Technical Approach

The approach employed in this research for improved selection and training of FOs incorporated a profile development, a task analysis of the FO job, and a training analysis of the FO component of the Field Artillery Officer Basic Course (FAOBC).

The objective of the profile development was to examine the critical characteristics, abilities, aptitudes, personalities, and personal histories of the successful FOs. Profile development activities accomplished during this study included: generating descriptive data; developing questionnaires; and developing, validating, and cross-validating a model which can be used to predict successful FO performance.

The purpose of the forward observer task analysis was to identify the essential skills and knowledges that an FO needs in order to perform his combat role. This was accomplished by developing and refining a task list utilizing survey and structured interview techniques and validating that list by obtaining task difficulty and criticality ratings from subject matter specialists (experienced FOs) and Fire Support Team (FIST) Chiefs and by obtaining task ratings from several hundred Field Artillery Officers with operational experience. Once these ratings were obtained, a task selection algorithm was developed which provided a prioritized list of FO tasks. This list, together with the critical skills and characteristics of the FO obtained from the profile development activity, served as the basis for the third major research element, the training analysis.

The training analysis was completed to establish current FO training content, procedures, and techniques, and to assist in the examination of possible impact of the profile development and task analysis findings. To accomplish this, Field Artillery Officer Basic Course classes and field exercises were observed, instructors were interviewed, and preliminary findings of the profile development and task analysis activities were reviewed with U.S. Army Field Artillery School personnel.

Findings

The results of the profile development activity suggest that mathematics ability, participation in sports activity, and desire to be an artillery officer are related to successful FO performance. The observed fire exercise grades and Field Artillery Officer Basic Course final grade were significantly affected by a cluster of map skills including target location, distance estimation, and navigation. Those entering FAOBC with a base of knowledge in map reading skills performed better throughout the course. An additional profile development result relates to the emphasis placed on learning maneuver unit tactics and interacting successfully with the maneuver commander. This important interaction currently receives very little attention in the basic course curriculum.

The task analysis effort revealed that map reading skills are among the most critical along two dimensions, combat essential and consequences of inadequate performance. Additionally, of the 69 tasks identified as FO tasks, 42 were selected as being critical training tasks for FAOBC.

An important finding and methodological innovation of the task analysis activity pertains to obtaining difficulty and criticality ratings for a broad range of battle scenarios. Obvious difficulty by scenario patterns emerged for terrain analysis and map reading. (For example, certain tasks important for a European scenario would not be important for an African scenario.)

The training analysis revealed some discrepancies between the list of tasks taught in FAOBC and the list of tasks emerging from the task selection algorithm which relied heavily on the inputs from experienced artillery officers. The discrepancies which were noted were not interpreted as major difficulties, but rather as areas for further examination. Some tasks appear to receive greater emphasis than the difficulty and criticality ratings would warrant. On the other hand, some tasks such as map reading are only reviewed briefly in the course yet they appear to represent the foundation of successful performance according to the consensus of FOs and more experienced artillery officers.

Operational Potential

The research documented in this report can be used as a basis for improving the training of forward observer tasks, whether performed in the traditional role or within the context of the FIST. Techniques for selecting those individuals who can perform FO duties effectively have been identified. Furthermore, a means for identifying those individuals requiring additional or modified map reading and terrain association training can readily be developed from the data provided by this research.

This report, importantly, has documented the traditional role of the FO. As such it can serve as a useful reference in further development of the FIST concept. The profile development activity has identified characteristics of the contemporary FAOBC student population. This same population must be used for the selection of FIST Chiefs. The task analysis activity has provided task difficulty and criticality information which should be very useful for allocating tasks among FIST members. Finally, the training analysis has identified prerequisite skills and useful training techniques which are applicable not only to training of forward observers but for training anyone who must perform the FO component tasks within the Field Artillery system.

1.0 INTRODUCTION

The U.S. Army Field Artillery School at Ft. Sill, Oklahoma, is charged with the responsibility for training artillery officers in all facets of artillery systems performance. One component of this system is the location of enemy targets and subsequent destruction of these targets through direction of fire by an observer located in a forward position in the combat zone, remote from the artillery pieces. The accuracy and rapidity with which the forward observer (FO) is able to perform these tasks has a direct bearing on the outcome of the battlefield situation, i.e., whether enemy targets are destroyed or disabled. With advances in battlefield weapons technology and enemy mobility, the role of the FO has become even more critical. Recently, concern has been expressed regarding the selection of personnel who are best suited to perform these tasks and the requisite training necessary to increase the efficiency and effectiveness of the combat artillery unit.

In response to this concern, a Weapons System Training Effectiveness Analysis study (WSTEA-I, 1977) was conducted by the Directorate of Evaluaation at the Army Field Artillery School. That study focused on the FO component of the Field Artillery System. It revealed that considerable improvement in the effectivenss of the system could be achieved by improving the accuracy of both target acquisition and location on the part of the FO. The officers conducting the study concluded that usually the Field Artillery Officer Basic Course (FAOBC) graduate did not properly use military maps.

Additional studies (Eschenbrenner & Taylor, 1969; Taylor & Eschenbrenner, 1970; Taylor, Eschenbrenner, & Valverde, 1970; Domingue, 1973; Laveson & DeVries, 1973; U.S. Army Combat Development Command 1968; U.S. Army Field Artillery School, 1975; and Thomas 1976)

suggest the same conclusion reached by the WSTEA team. Forward observers are not performing at acceptable levels overall and in some cases, performance is so far below acceptable Army Training and Evaluation Program (ARTEP) standards that it could severely impair combat effectiveness. In order to help upgrade the performance level of the Field Artillery subsystem, increased emphasis must be placed on the selection and training of FOs who can demonstrate competence on combat-referenced operational performance measures. This can be achieved by analyzing the forward observer tasks, developing a profile of the effective forward observer, and specifying the correspondence between this profile and valid performance criteria. The obvious implication of these studies is that current performance levels of FOs must be improved to enhance overall system effectiveness.

In a second phase of the WSTEA (WSTEA-II, 1978) program, training was augmented by use of the "thought-process", a procedure designed to aid the student in completing the necessary procedures for accurate target location. A systematic evaluation of the use of this "thought-process" failed to show an effect on self and target location accuracy. It appears that the difficulties which have been found in the area of target location reflect a more basic problem which is not likely to be solved by a single training aid. The ARTEP standards for target location were obtained on only 45% of the test cases analyzed.

In order to provide data which can be used to help upgrade the performance level of the Field Artillery FO and thereby improve the combat effectiveness of the field artillery system, the present research was conducted. An in depth look at the traditional FO job was essential to provide a proper base for improving FO job performance and to clarify the base from which the Fire Support Team (FIST) concept has developed. Information reported herein should be of value for improving the selection and training of FO's, whether officers or enlisted men. It should also provide a data base which might also be useful to developers of FIST.

Combat Effectiveness. Throughout the present research, emphasis was placed on developing the methodology for improving selection and training of FOs who can demonstrate competence on operational combat referenced performance measures. One goal has influenced virtually every element of the research. That goal is to improve the combat effectiveness of the Field Artillery Lieutenant. Studies of combat effectiveness have shown that it is extremely difficult to perform research in a combat environment, but they have also provided insights which are useful. Below is a brief discussion of selected studies of combat effectiveness which have influenced the present research.

The most in depth study of combat effectiveness was conducted during the Korean War. During that period, the Army conducted an extensive personnel research program directed toward the improvement of performance of all combat arms personnel. Edgerton and Graham (1951) conducted interviews and developed a list of approximately 1100 descriptors of combat behavior from which a forced choice performance rating instrument was developed. They found that the successful soldiers, as nominated by their peers in Korea, were described as social, intelligent, alert, and possessing leadership qualities.

A pertinent research program during the Korean War time-frame was that of the Personnel Research Branch (PRB) of the Adjutant General's Office, which is now the U.S. Army Research Institute for the Behavioral and Social Sciences, under the Deputy Chief of Staff for Personnel. That program relied heavily on NCO ratings of combat effectiveness. The PRB investigators sought actively to conduct research where face-to-face contact with those experiencing infantry combat was possible. Aside from generating the specific data about the nature of the combatants, the PRB program demonstrated effectively that research near the front lines is possible (King, Campbell, Johnson, Klieger, and Yaukey, 1951).

Using ratings obtained from superior officers, King, et al., (1952) sought to examine the possible link between performance at West Point and rated combat effectiveness. When 43 company grade officers who were

academy graduates were studied, relatively high validity coefficients were noted. The best of the 15 predictors considered was an Aptitude for Service Rating which was assigned during the senior year at West Point.

Johnson, Burke, Loeffler, and Drucker (1955) studied the 5th Cavalry Regiment and 35th Infantry Regiment in Korea in 1951 and developed a combat self-description blank on which soldiers answered multiple choice items about biographical information and indicated preferred personal characteristics. A modified version of this self-description blank was used in other studies by PRB researchers. Haggerty, Johnson, King (1959) were able to use "Mail-order" ratings to get combat performance estimates for West Point graduates.

Near the end of 1953, the PRB initiated research to identify the most promising of a large number of new experimental combat predictors and to validate those predictors in a longitudinal study involving approximately 4000 soldiers. The most promising predictors found in the longitudinal studies have been incorporated into the Army's combat arms aptitude tests (Helme, Willemin, & Grafton, 1974). After the longitudinal study was outlined, variables were selected and then separately validated on intermediate criteria for each of the four combat arms branches: infantry, armor, combat engineers, and artillery (e.g., Birnbaum, Rosenberg, White, and Willemin, 1975; Birnbaum, White, Rosenberg, and Willemin, 1957a).

When evaluating the Korean studies of the PRB group and the Human Resources Research Organization (HumRRO) team in an attempt to refine the newly defined directions in the Army selection research, Willemin, Birnbaum, and Rosenberg (1957a) noted that, "... the best results for efficient combat classification were most likely to come from measuring not only technical skills and abilities but also such factors as personality, motivation, interest, and attitudes (p. 1)." The Willemin, Birnbaum, and Rosenberg evaluation resulted in the selection of 16

predictor instruments for use in a longitudinal study of the infantrymen. The coefficients for the Willemin, Birnbaum, and Rosenberg (1957b) study tended to be positive and around .20. The strongest coefficients were for fifth week of training (peer ratings), Arithmetic Reasoning, Reaction to Signals, and the General Information Test. The predictive value of arithmetic reasoning led to a careful examination of mathematics ability as a predictor of FO performance. The predictors studied by the HumRRO team tended to improve selection for all four combat specialty areas (Willemin, and Rosenberg, 1957b; Birnbaum, Rosenberg, White, and Willemin, 1957).

At the conclusion of the seven-year PRB effort to improve the Army Classification Battery, an endeavor which had included the study of approximately 1000 soldiers in Arctic maneuvers, 2000 in Korean combat, and 2000 in peacetime, some firm conclusions could be drawn. Most important were: (1) the need for the inclusion of personality material in combat arms selection batteries, and (2) the need for interest area information in the selection batteries (Willemin and Karcher, 1958). These conclusions were not ignored in the present effort.

The major components of the present effort were:

- Profile Development - developing and provisionally validating a profile of the effective forward observer.

  The profile development activity included generating descriptive data about the actual and desired FO and developing a questionnaire and validating a model which can be used to predict successful FO performance.

- o Task Analysis - identifying and analyzing required forward observer tasks.

  The task analysis was an iterative process which involved generating task lists from official publications and Artillery Officer inputs, revising those lists in interviews with FAOBC instructors, and validating the task lists using a procedure which required officers to rate the tasks on dimensions of difficulty and criticality.

- o Training Analysis - applying a systems approach to analyze present training of forward observer skills drawing upon results of the task analysis and profile development activities.

  The training analysis includes a comparison of the outcome of the task analysis with existing FO training and draws upon inputs from FAOBC students, instructors, and experienced Field Artillery Officers. Training implications from the other research elements are consolidated within the training analysis section.

In performing the research, inputs were obtained from students in the four FAOBC classes, from instructors at the Field Artillery School, and from experienced Field Artillery Officers. Fifty-seven officers from four Divisions were interviewed and questionnaire data was obtained from 332 officers, all of whom had served as FOs or FIST chiefs.

In addition to the three major elements of this report is an annotated bibliography of FO related literature and appendices which include copies of survey and interview forms used as well as data summaries too extensive to be included in the main text.

2. Profile Development

The profile development activity was conducted to achieve two major objectives. The first was to describe the present OBC population; whereas, the second was to develop models of Forward Observer (FO) performance which might be useful in the development of selection tools. It is believed that the model might also have application to broad scope combat modeling activities; that is, a model of FO performance could be used as a component of a model of Artillery system performance at any level from the Fire Support Team (FIST) to the Division Artillery.

Three major work elements were accomplished: first, developing FO task lists; second, obtaining critical information about the FO from instructors and individuals assigned as FO's or FIST Chiefs; and third, developing a description of the desired performance capabilities of the successful FO. These form the foundation for accomplishing the two major objectives and are discussed in greater detail below.

Developing FO Task Lists

This work element, which drew extensively from the task analysis, provided a context for determining the critical skills and abilities required to perform as an FO. This step was used to establish whether or not the ability level and skills found among the Artillery Lieutenants were consistent, and compatible with the job to be completed. To accomplish this, a specification of that job was necessary. Such a specification is only part of the information gained from the task analysis. Since the task analysis was conducted as a major component of the present research program, and extensively reported in Section 3 of this report it will not be described here. Briefly, however, the task analysis was used to develop and refine an extensive list of FO tasks. These tasks were used in conjunction with other materials to develop the FO profile.

Description of the Officer Basic Course Population

The US Army Field Artillery School obtains information about college major and minor, source of commission, marital status, and other demographic data as well as scores on the mathematics portion of the Sequential Test of Educational Progress (STEP) and the nonverbal battery of the Lorge-Thorndike intelligence test. The two tests are administered after the officers arrive at Fort Sill. In order to determine the characteristics of the FAOBC population for selection and training purposes, it was necessary to supplement the data routinely collected by the USAFAS with information about the students' backgrounds, interests, and abilities. To this end a personal information questionnaire was developed. A description of the questionnaire which was developed is presented below. It is followed by a presentation of descriptive data about the FAOBC population drawn from several sources and then, by information about the characteristics of the effective Forward Observer which was obtained using a questionnaire which was completed by 332 Artillery Officers.

Development of the Forward Observer Personal Profile Questionnaire. In order to identify background factors, interests, activities, and abilities of the FO population, Developmental Form A of the Forward Observer Personal Profile Questionnaire (FOPPQ) was developed as a research instrument. In developing the questionnaire an attempt was made to find items which would provide a broad distribution of scores and, additionally, to identify those factors which could be expected to have a relationship to individual combat effectiveness as measured by several criteria.

A device developed specifically to differentiate among combat effective and combat ineffective pilots, the Pilot Life Inventory Questionnaire (Youngling, Levine, Mocharnuk, and Weston, 1977), and results of an item analysis on that device proved useful in developing the FOPPQ. Some items from the Pilot Life Inventory Questionnaire were adapted for use in the FOPPQ, and a few others were used without modification. Also useful for developing the FOPPQ were a test which has

related attitudinal, achievement, and personal data to on the job performance (Nelson, Marco, and Banks, 1976) and the Division 14 (of the American Psychological Association) file of personal information items.

The FOPPQ was divided into five sections, A through E, according to the type of answers required and the general nature of the data sought. The former division was for ease of administration and data reduction; whereas, the latter was to allow selective use of sections, if necessary, to provide continuity for those completing the questionnaire. This test format additionally provided an organizational scheme for potential users of the questionnaire data. Section A consisted of life experience and activities questions where multiple responses could have been appropriate. Items in Section A included varied topics from participation in sports to use of calculators. Section B included life experience items which required a single response. Topics included size of hometown and identification of courses in which the student received the highest grades. Section C also required a single response but focused specifically on issues pertaining to being in the Army. Sections D and E included attitude questions with responses from strongly agree to strongly disagree. Section D focused on FO related issues, and Section E had a broader scope.

A profile of the student population began to emerge from the FOPPQ summary data. Percentages of the combined populations of FAOBC 12-78 and FAOBC 1-79 students responding to a particular item are indicated on the copy of the FOPPQ in Appendix A for all sections. Average scale values (using a five point scale ranging from strongly agree equaling 1, to strongly disagree, equaling 5) are also indicated for Section D and E items. Some highlights of those summary data are presented below.

Item A4, which asked which mathematics courses have been completed, is summarized in Table 2-1. Note that a substantial number of the students (32%) had not even completed college algebra. When one considers that those who have completed one mathematics course tended to be

TABLE 2-1

Summary of item analysis data for FOPPQ item A4, "Which mathematics courses have you completed?"[1]

Correlation with OBC grade[2]
(Based on OBC 12-78)

	% of students responding	AA-0202	CC-0201	GD-202	GD-203	GD-204	GD-0205	GØ-0201	GØ-0211	TB-0201	TB-0202
Plane Geometry	67%	.11	.23**	.15*	.19**	.10	.25**	.11	.09	.21**	.15*
Solid Geometry	40%	.06	.21**	.18*	.22**	.21**	.26**	.19*	.15**	.22**	.15*
Analytical Geometry	39%	.09	.18*	.22**	.26**	.24**	.29**	.18*	.18*	.22**	.14
College Algebra	68%	-.09	.09	-.03	.02	-.02	.02	.02	.07	-.04	.02
Trigonometry	54%	.05	.16*	.17*	.21**	.20**	.26**	.15*	.13	.17*	.11
Calculus	47%	.10	.20**	.32**	.32**	.32**	.37**	.26**	.18*	.30**	.16*

[1]Students were asked to mark all applicable alternatives

[2]Cell entries are r values

[3]Based on data from OBC 12-78 and OBC 1-79

$*P \leq .05$

$**P \leq .01$

the same individuals who had completed other mathematics courses, a picture emerged which showed that a substantial number of the FAOBC students had not completed even the more elementary mathematics courses. This is of special importance when one examines Table 2-1 and notes that having completed mathematics courses (excluding college algebra) was significantly related to success on several FAOBC exams. As will be seen later, a mathematics score was a major component of a model which predicted FAOBC performance.

Complimenting the finding that those who had completed math courses tended to perform better in FAOBC was the finding that those who obtained their highest grades in math or science tended to perform better. Item B25 asked in which academic classes the highest grades were received. The percentage of FAOBC 12-78 and FAOBC 1-79 students responding to each alternative was as follows:

Did not attend college or grades were same in courses (2.2%)
Math, physics, chemistry, or engineering (17.4%)
Biology or physiology (7.9%)
English or Journalism (11.2%)
Business or Commerce (10.6%)
Foreign Languages (3.9%)
History or Political Science (23.6%)
Psychology or Education (8.4%)
Some field not mentioned (14.6%)

Several items from Section C are of interest. Table 2-2 summarizes the OBC 12-78 responses to Item C2 and demonstrates the relationship of first branch choice to scores on ten selected component grades in OBC. As can be seen in Table 2-2, 41% of OBC 12-78 had chosen Artillery. Furthermore, selecting Artillery as the first branch choice was significantly related to better performance on most components of FAOBC. On the other hand selecting a noncombat branch other than Finance or AG was significantly related to lower scores on the test grades examined. Generally, there was no strong indication of either a performance

TABLE 2-2

Summary of OBC 12-78 item analysis data for FOPPQ item C2, "What was your first branch choice?"

Correlation with OBC grade[1]

	% of students responding	AA-0202	CC-0201	GD-0202	GD-0203	GD-0204	GD-0205	GØ-0201	GØ-0211	TB-0201	TB-0202
Artillery	41%	.08	.19**	.23**	.27**	.15*	.24**	.23**	.19*	.16*	.19*
Infantry	6%	.00	.01	.03	.01	.03	-.03	-.01	.03	.04	.04
Armor	8%	-.15*	.00	.03	.02	.03	.00	.02	.05	.03	.06
Combat Engineer	6%	.01	-.06	-.03	.02	.02	-.06	-.13	-.05	.04	-.05
Finance	3%	.08	.08	.04	-.01	.01	-.06	.05	.00	.07	.01
Adjutant General	8%	-.02	-.04	-.09	-.05	-.09	-.08	-.05	.03	-.19**	-.02
Other non-combat branch	28%	-.03	-.18*	-.22**	-.29**	-.16*	-.16*	-.17*	-.24**	-.14**	-.23**

[1]Cell entries are r values

$^{*}P \leq .05$

$^{**}P \leq .01$

advantage or decrement for those whose branch choice was Finance, AG, or a non-Artillery combat arm. Two exceptions were the negative relationship between selecting Armor and the AA-0202 (Targeting) score and the negative relationship between selecting AG and the TB-0201 (Artillery Tactics) score. The data showed that those who were at the Field Artillery School by choice performed better on almost every grade.

Item C3 asked the OBC student to indicate his preference for demanding or tolerant commanders in two environments. Data from Item C3 are presented in Table 2-3. Seventy-five percent of the students indicated a preference for a commander who is demanding in the battle area. It is interesting to note that those who preferred a commander who was tolerant in both the garrison and the field environment tended to score lower on the GD-0204 gunnery exam and on the GØ-0211 observed fire score. Those were statistically significant effects which would suggest a motivational factor.

Item 3 of Section D was related indirectly to the branch choice question. Item D3 asked if being an FO was a rewarding job. Responses to that item are summarized in Figure 2-1. One might expect those who were in a branch by choice also found it more rewarding. The pattern of responses to this item revealed that a substantial number of students did not state an opinion. It appears that those who agreed with the statement tended to perform better in OBC.[1] Possible explanations of the relationship are that those who found their jobs rewarding were motivated to perform better or, alternately, that those who had the skills to perform well enjoyed it more. The direction of the effect could not be discerned from the available data, but since the questionnaire was completed early in OBC--before self knowledge of FO performance ability was available--the motivational hypothesis would appear more acceptable.

---

[1]Statistics supporting that relationship are presented in the performance modeling section.

TABLE 2-3

Summary of OBC 12-78 item analysis for FOPPQ Item C3,
"Under which type of commander would you most like to serve?"

	% of students responding	GD-0204	GØ-0201	GØ-0211
Tolerant in both garrison and in the battle area (field environment)	23%	-.17*	-.12	-.20**
Tolerant in garrison, demanding in the battle area (field environment)	44%	-.11	-.05	-.03
Tolerant in the battle area (field environment), demanding in garrison	2% (3 people)	.07	.04	.07
Demanding in garrison and in the battle area (field environment)	31%	.02	.15*	.13

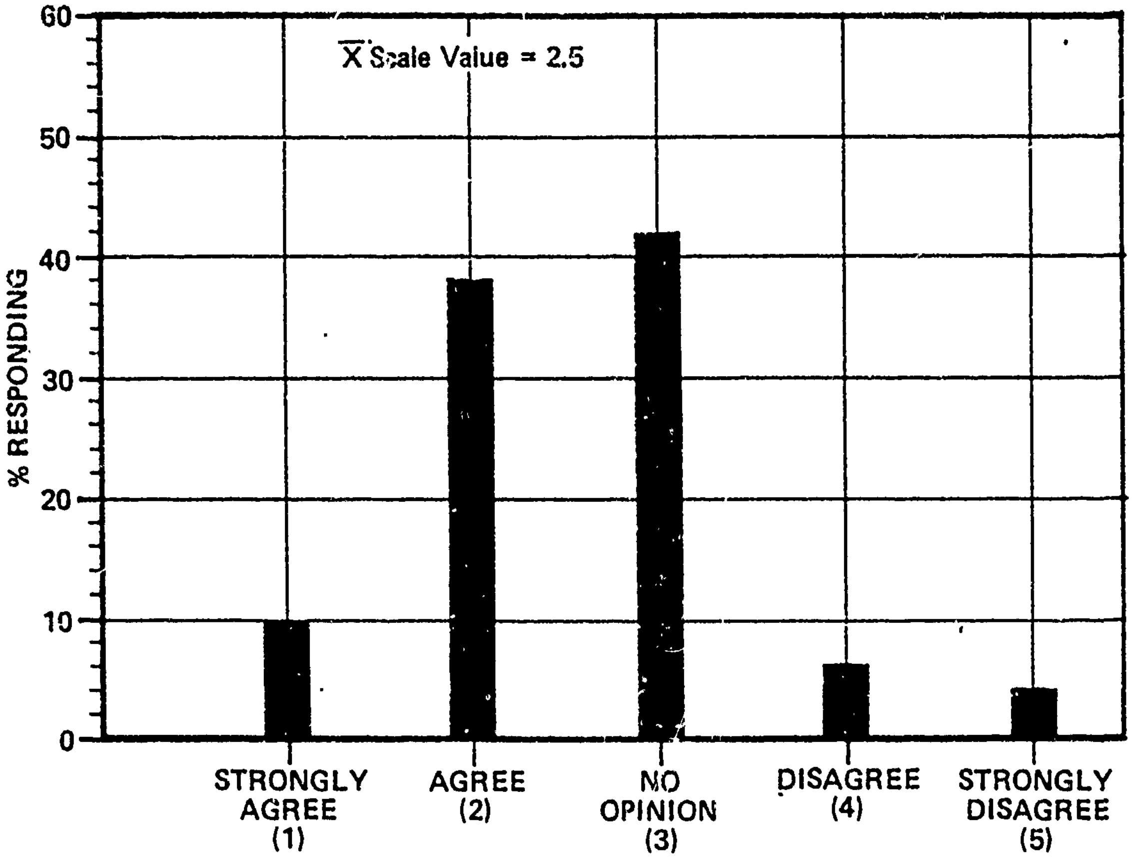


FIGURE 2–1 SUMMARY OF RESPONSES TO FOPPQ ITEM D3, "Being an FO is a rewarding job."

Another item, D9, provided insight about the probable interest and motivational level of certain students. As can be seen in Figure 2-2, about 39% of the OBC 12-78 students responding expected to make a career of the Army. Recall that the Forward Observer Personal Profile Questionnaire was completed shortly after most of the officers had begun active duty. The interactive nature of items D3 and D9 also provided insight. About 42% of those officers who expected not to be in the Army in ten years agreed or strongly agreed with the statement that being an FO was a rewarding job. A similar percentage was noted for those who were undecided about whether or not they expected to remain in the Army. On the other hand, 58% of those who expected to be in the Army in ten years indicated that the FO job was rewarding.

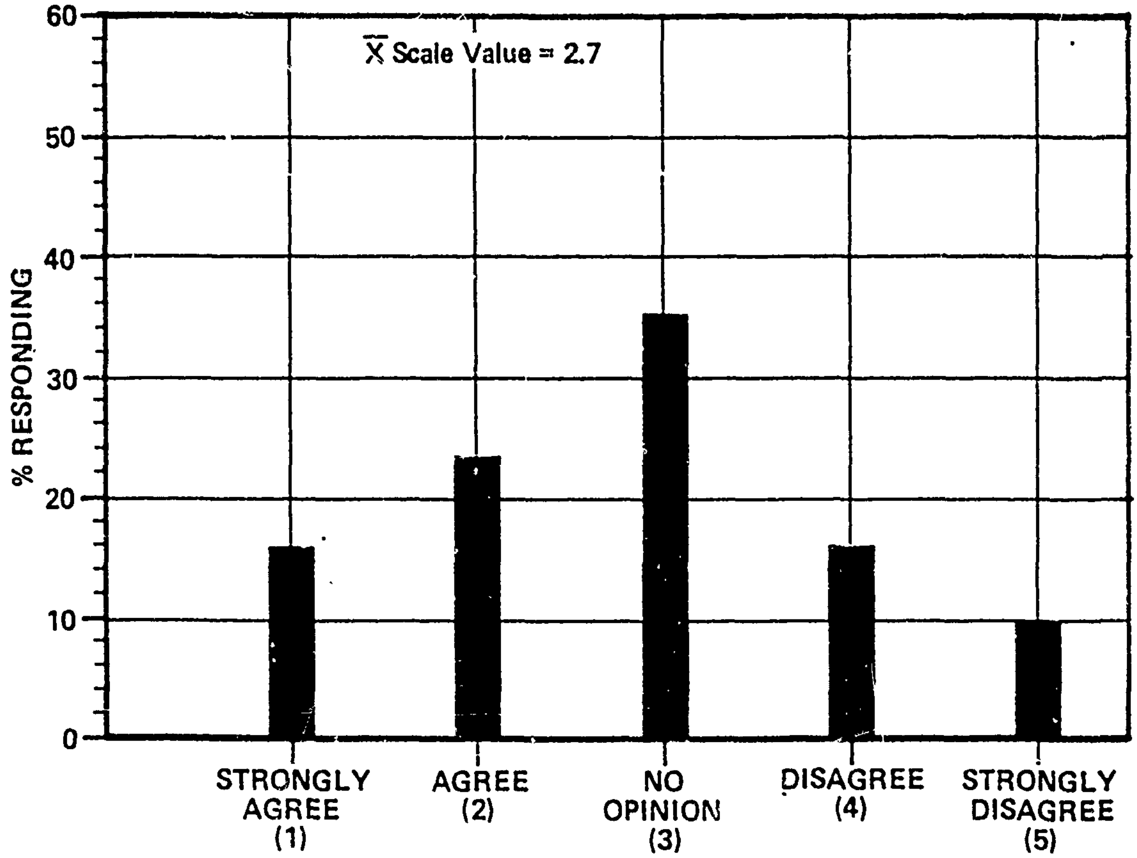


FIGURE 2–2 SUMMARY OF RESPONSES TO FOPPQ ITEM D9, "I expect to be in the Army ten years from now."

As an interesting aside, in OBC 12-78, only one individual responded with strongly disagree to both items D3 and D9. That individual did not pass any of the subelements of the course. A large proportion of the students indicated that skill was an important element of hitting the target as is shown in Figure 2-3. Inspecting Figure 2-4, however, one may note that over a third of the OBC 12-78 students believed that luck plays a part in first round accuracy.

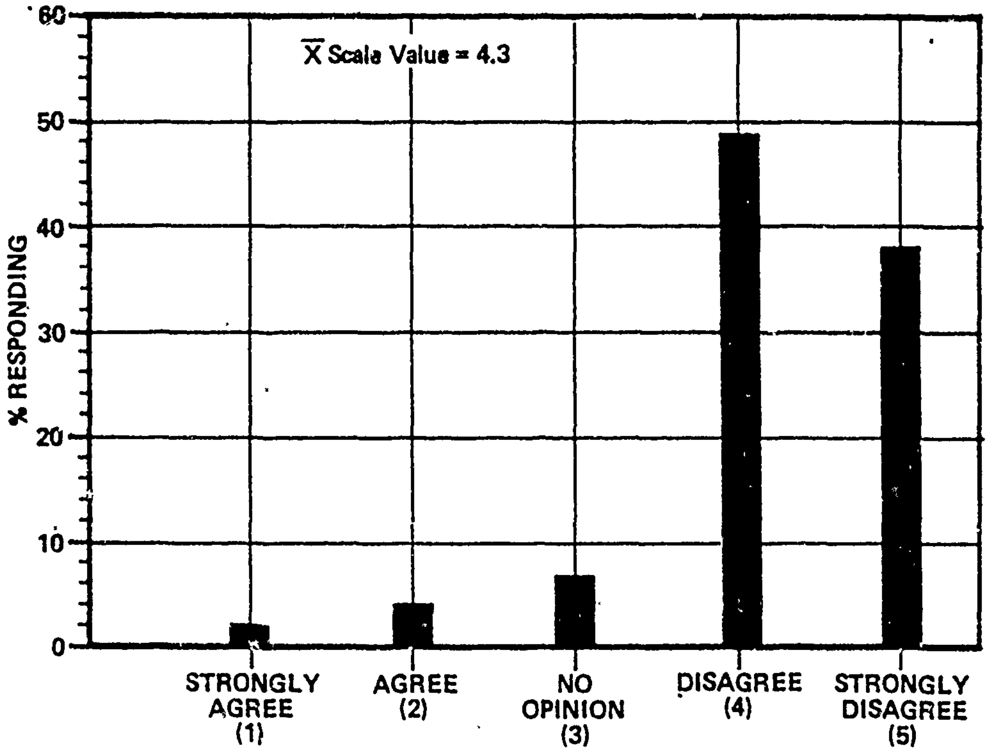


FIGURE 2–3 SUMMARY OF RESPONSES TO FOPPQ ITEM D7, "High hit probability is a function of chance not skill."

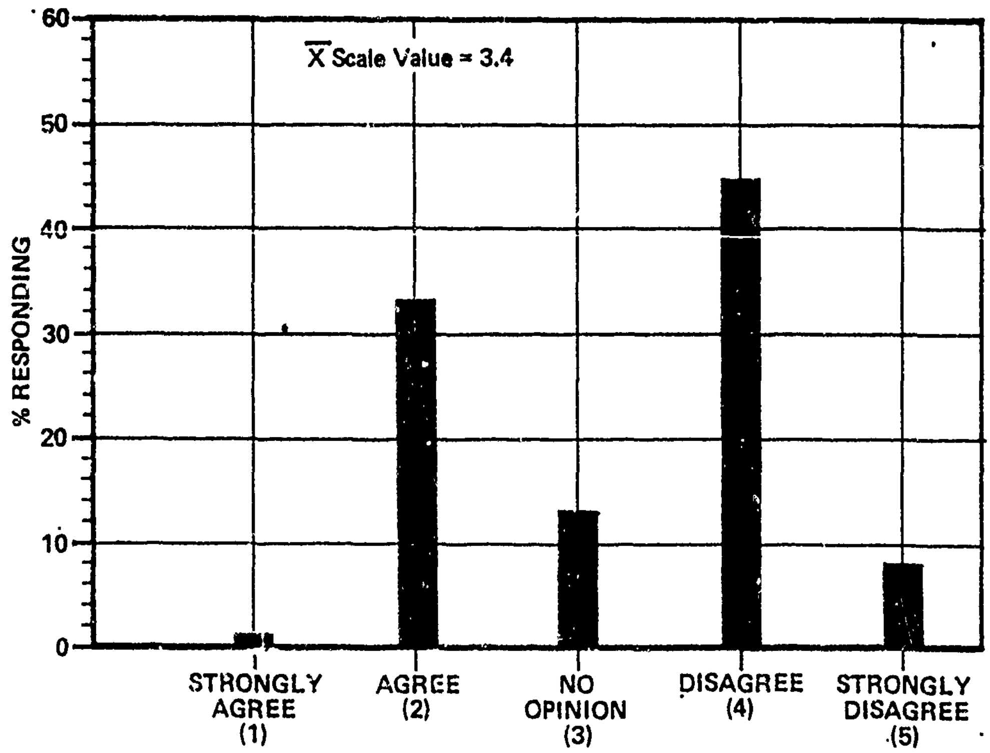


FIGURE 2–4 SUMMARY OF RESPONSES TO FOPPQ ITEM D16, "The difference between hitting the target the first time and missing it is often a matter of luck."

Three Section D items had particular relevance to training. Responses to Item D5, which are summarized in Figure 2-5 suggested that the new Artillery Lieutenants recognized the importance of knowing FO skills. Furthermore, they seemed to recognize that many FO skills

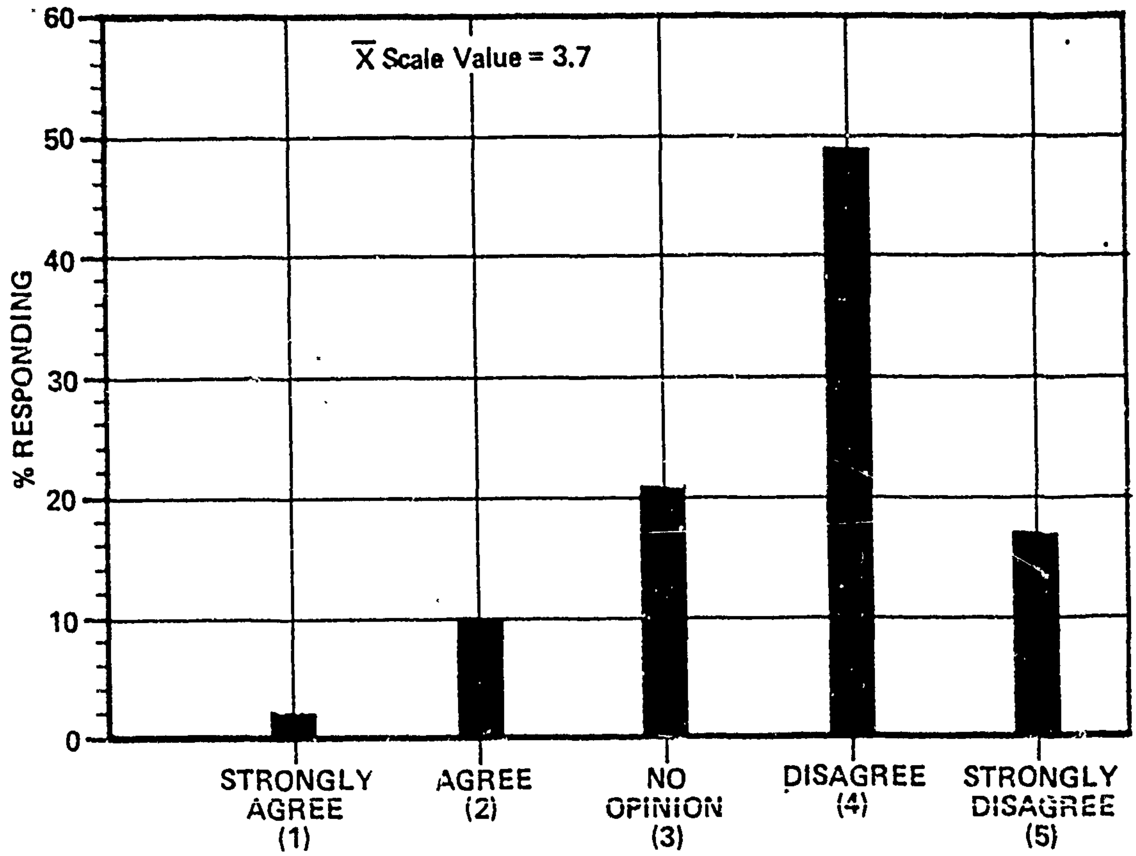


FIGURE 2–5 SUMMARY OF RESPONSES TO FOPPQ ITEM D5, "Less time should be spent on FO training and more on career related administrative skills training."

cannot be exclusively classroom trained as indicated in Item D20. As can be discerned from Figure 2-6, 85% of the FAOBC 12-78 students agreed or strongly agreed with the statement, "The job of the FO cannot be taught in the classroom. It requires on-the-job training."

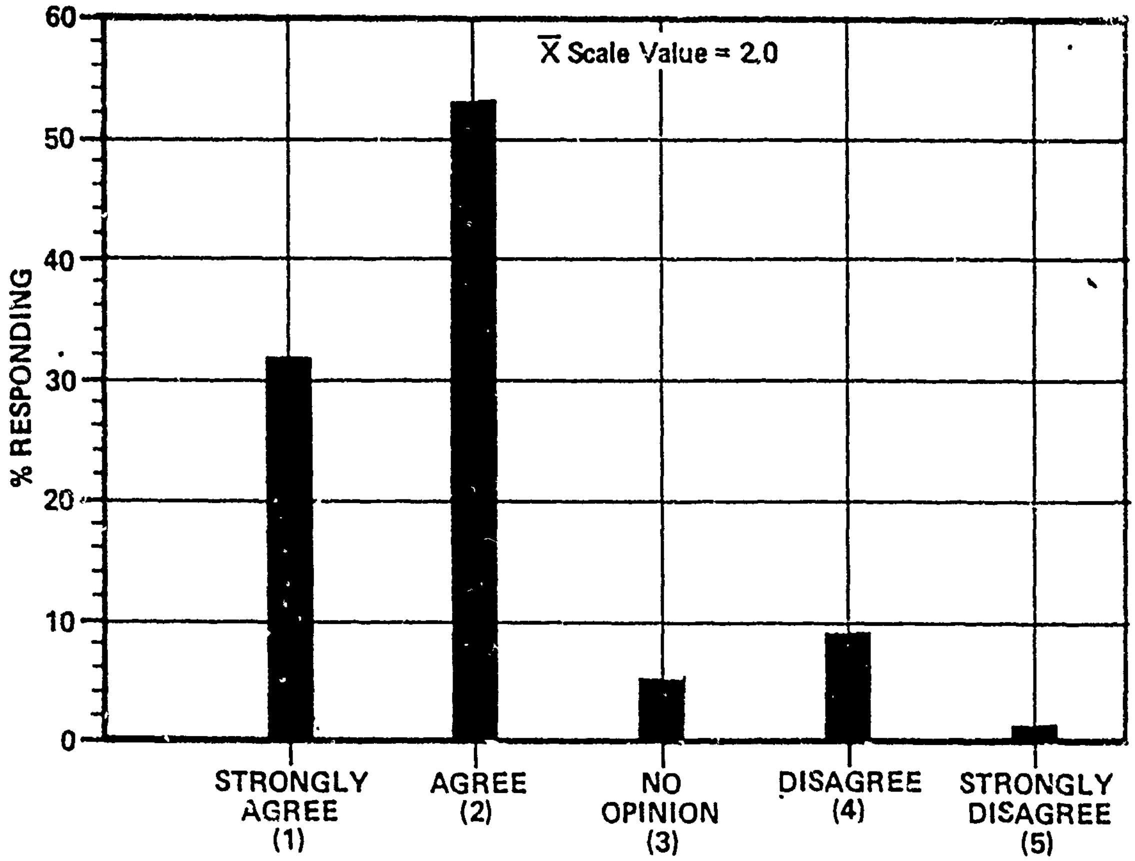


FIGURE 2–6 SUMMARY OF RESPONSES TO FOPPQ ITEM D20. "The job of the FO cannot be taught in the classroom. It requires on the job training."

The third Section D item with particular relevance to training pertained to preparation for FAOBC. Item D21 stated, "My precommission military training has given me the skills needed to perform well in OBC." Figure 2-7 contains a summary of the OBC 12-78 responses to that item. Only 52% of officers responded agree or strongly agree with that statement. Furthermore, 29% disagree or strongly disagree which suggested that they did not have the prerequisite skills. When responses to Item D21 were sorted by source of commission it became obvious that, by self assessment, more ROTC officers felt unprepared. This pattern was consistent with actual performance and with responses to a training questionnaire which was administered to three FAOBC classes. This is pursued further in the training analysis section of this report.

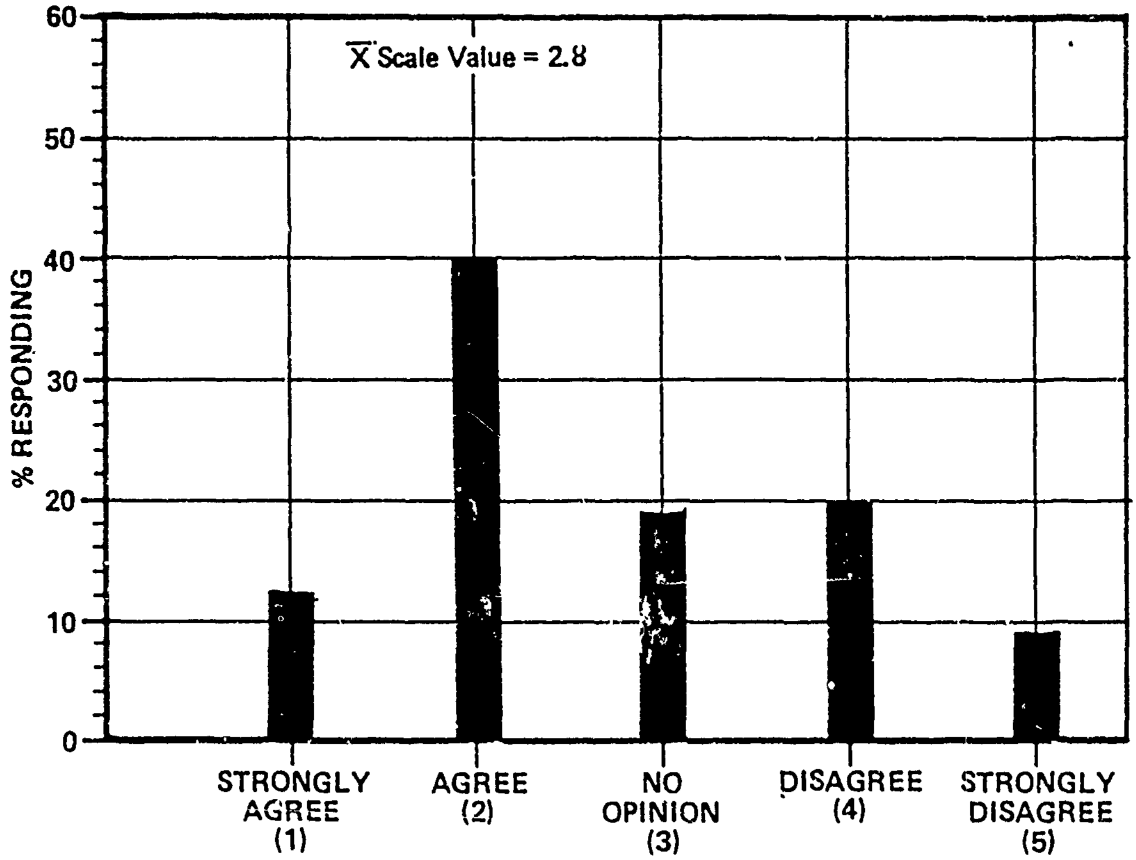


FIGURE 2–7 SUMMARY OF RESPONSES TO FOPPQ ITEM D21, "My precommission military training has given me the skills needed to perform well in OBC."

Figure 2-8 contains summary data from FOPPQ Item D14 which was, "Being an effective FO is a stand alone job." As can be seen in Figure 2-8, only 19% of the sample responded agree or strongly agree. Even this level of agreement is somewhat surprising because it is clear that the conventional FO job requires constant interaction with and reliance upon other elements of the Field Artillery subsystem and the maneuver unit. This dependency is expected to increase as the Lieutenant's role changes with the implementation of the Fire Support Team (FIST) concept.

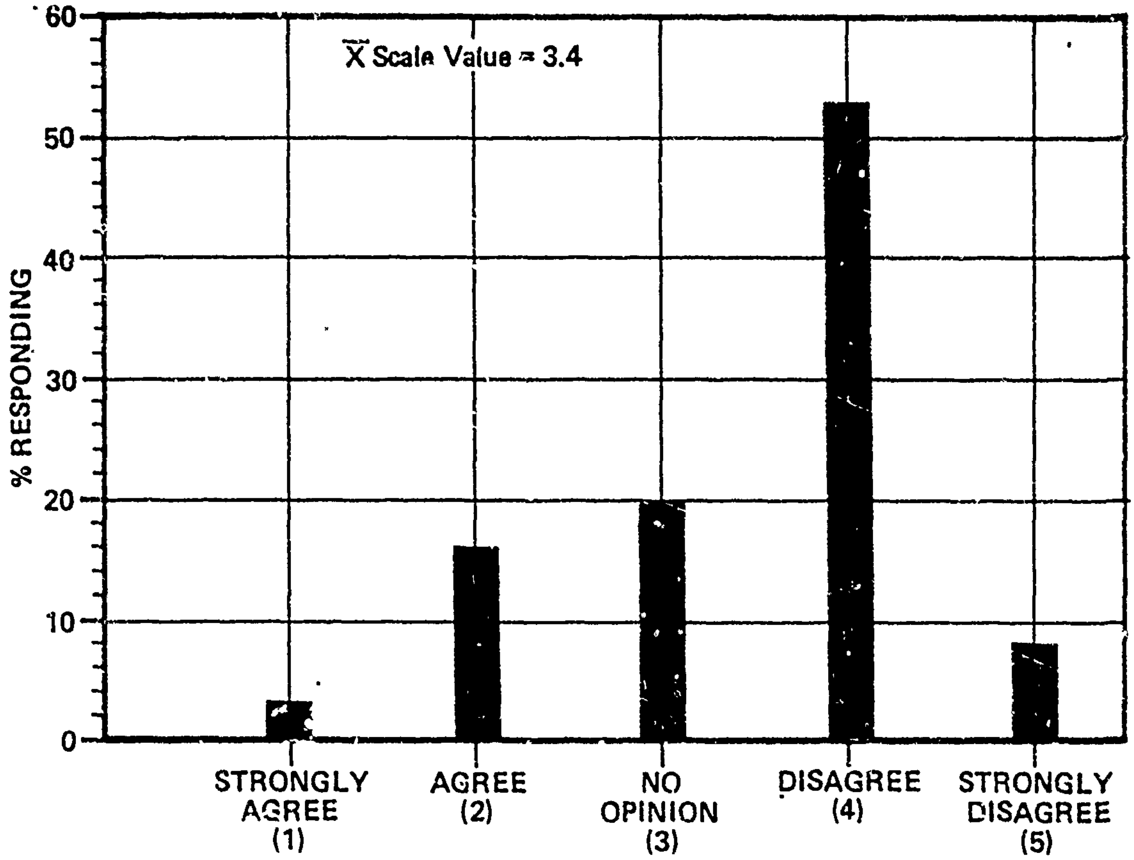


FIGURE 2–8 SUMMARY OF RESPONSES TO FOPPQ ITEM D14, "Being an effective FO is a stand alone job."

<u>Forward Observer Characteristics Derived from Experienced Field Artillery Officers</u>

The Forward Observer Questionnaire (FOQ) was created to obtain ratings of FO tasks, information about training issues, reactions to systems changes which impact FO performance, and data about the critical skills and characteristics of effective FOs. The questionnaire was mailed to six hundred Artillery Officers. A sampling procedure was developed which identified a representative set of officers at three experience (rank) levels and further distinguished between those with or without Viet Nam experience.

From the set of all Artillery Officers on active duty with duty experience as an FO or FIST chief, 200 Lieutenants (Second and First), 200 Captains (half with Viet Nam experience), and 200 Majors (half with Viet Nam experience) were selected. The FOQ was mailed with a postage paid return envelope to each of those 600 officers along with a set of instructions and a letter from Brigadier General Dinges, the Assistant Commandant of the Field Artillery School. A copy of the entire package is included in Appendix B. Table 2-4 shows the number of questionnaires returned by each of the five subgroups. Data from the FOQ pertinent to the task analysis and training analysis will be presented in later sections.

The fifth open ended question of the FOQ asked, "What personal characteristics are necessary for an individual to become a good FO?" In response to this, a plethora of adjectives appeared, but many descriptors grouped together reasonably. The 22 most frequently named characteristics are listed in Table 2-5. Included is a set of characteristics that a superman might possess, but certain items appeared sufficiently often and fit with what is known about the FO to such a degree that interpretation was possible. These characteristics describe the preferred but not necessarily ideal FO.

"Common sense" heads the list of characteristics, but the one which provided the most insight about the FO job is "Work well with maneuver unit." This was viewed by the experienced officers as a personal characteristic not as a task to be completed. Undoubtedly, however, certain skills can be taught which enhance such interactions. Some comments from other open ended items on the FOQ also suggest that working with the maneuver unit, learning their tactics, and knowing how to "sell" Field Artillery capabilities to the unit are important to Artillery Officers.

Table 2-4

Forward Observer Questionnaire Return Rates

	Total	2 and 1 LT	CPT Viet Nam Experience	CPT No Viet Nam Experience	Maj Viet Nam Experience	Maj No Viet Nam Experience
Number of Questionnaires Mailed Out	600	200	100	100	100	100
Number of Questionnaires Returned	332	108	46	57	73	48
Percent of Questionnaires Returned	55.3%	54%	46%	57%	73%	48%

TABLE 2-5

Experienced Officers' Indications of the Personal Characteristics of the good FO

CHARACTERISTIC	LT	Cpt. V	Cpt. no-V	Maj. V	Maj. no-V	Total
Common Sense	24	13	15	11	15	78
Confidence (self)	20	13	13	4	17	67
Calm/Reacts well under pressure	23	10	7	10	7	57
Decisive (thinks & acts quickly)	26	6	10	4	10	56
Agressive	19	4	11	7	12	53
Work well with maneuver unit	16	4	4	4	12	40
Intelligent (logical)	10	3	4	3	12	32
Physically Conditioned	6	7	5	6	5	29
Leadership	5	5	3	1	4	18
Works well with others	12	-	1	2	2	17
Willing to learn	6	2	3	2	4	17
Map Reading Ability	5	1	5	1	3	15
Independence	5	2	4	1	2	14
Technically Competent	1	5	1	4	3	14
Desire	3	2	0	1	8	14
Motivated	7	2	1	2	2	14
Math Ability	1	4	3	2	3	13
Patient	9	1	-	-	3	13
Flexible	5	6	-	1	1	13
Dedicated	2	-	-	2	1	11
Good Eyes	2	-	1	1	5	9
Likes the Field	6	-	-	-	-	6

Thinking, acting quickly, and reacting well under pressure are characteristics which were readily seen as important to successful FO performance. These characteristics can be aligned with many fire adjustment skills and judgments which must be made by the FO in a combat environment. Certain other factors such as map reading ability are more task related than ability related.

Math ability was cited as a characteristic by only 13 of the 332 officers yet this ability was identified as being strongly related to better scores on several FAOBC grades. This points out clearly a recurring phenomenon which impacts selection and training programs and reiterates the need for systematic job analysis. Skills and abilities which are not readily seen are often as important and sometimes more important for successful job performance than those which are obvious.

Generally, the list of characteristics of the good FO, generated from the FOQ, was consistent with other information sources, and with those other sources, provided data useful for the modeling and training analysis activities.

Development of Preliminary Selection Models

Preliminary selection models were developed using the same categories of personal information which were used in the description of the FAOBC population. The first step in consideration of selection models involved an assessment of criteria. The second step was a modeling activity which yielded predictive models of FO performance.

Criterion Selection. The criteria or measures of performance against which selection devices are evaluated, were selected according to pragmatic considerations. They had to be both reasonable and accessible. Three criteria were ultimately selected and received varying degrees of analysis. The first was target location accuracy. This was defined as first round target location error or radial miss distance (RMD), the distance from the student's specification of target location and actual target location, for selected shoots. The second was the

GØ-0211 observed fire score. The GØ-0211 score is an observed fire grade based upon all graded firing exercises for the student and the best two of three hasty target location exercises ("hasty hooters"). In determining the grade for each shoot, the instructor must include some subjective elements such as relative target location difficulty, but the grades are based primarily upon the accuracy, speed, and procedural adequacy with which the mission was handled. The third was overall success in FAOBC as reflected in the final grade.

Unfortunately other potential criteria from operational units were not available. First, standardized measures of FO performance do not exist. Second, even if the measures existed, no adequate means exist for tracking and extracting detailed measures of individual performance beyond the FAS environment without infringement on individual privacy. Measures of performance in the operational environment are necessary if a test is to be validated against intermediate operational criteria rather than school based measures. These difficulties did not preclude an effective selection of criterion measures. Instead they forced a more thorough analysis of the potential criterion measures which could be recorded and used. The criterion set was restricted to intermediate criteria which included training and performance measures collected at Fort Sill. The performance-based measures, RMD and the Observed Fire Score, GØ-0211, emerged as candidate criteria early and were of special interest because they could be expected to be more directly related to measures taken in unit testing environments, e.g., Army Training and Evaluation Programs (ARTEPS), than paper and pencil tests.

A second step in the criterion analysis process consisted of an evaluation of the interrelationships of several of the potential criterion measures. A spanning tree and a hierarchical tree were developed from a correlation matrix of selected criterion measures. The measures selected for evaluation were pinpointed through discussions with instructors as most relevant to FO task performance. Table 2-6 includes a list of OBC grades with a brief description of the content of each one.

Table 2-6

OBC Component Grades

Grade	Dept.	Weight	Description
AA-0201	CFD	38	Map Reading Practice
AA-0202	CFD	32	Targeting
CC-0201	C&E	20	Communications
CC-0202	C&E	30	Communications
GD-0202	GD	80	Fire Direction
GD-0203	GD	70	Fire Direction
GD-0204	GD	25	FADAC
GØ-0201	GD	50	Observed Fire Written
GØ-0211	GD	125	Observed Fire Practical
TB-0201	TCAD	90	Artillery Tactics
TB-0202	TCAD	90	Artillery Tactics
WC-0211	WD	30	Firing Battery
WC-0212	WD	50	Firing Battery
WC-0214	WD	40	Firing Battery
WM-0213	WD	50	Maintenance Management
WM-0215	WD	30	Maintenance Management
WM-0216	WD	45	Maintenance Management
WM-0217	WD	25	Maintenance Management

Weapons Department scores were excluded from consideration as measures of FO performance. Those measures reflected a different area of the artillery officer's responsibility. The correlation matrix of scores recorded for the 175 OBC 12-78 students for whom final FAOBC grades were available was used in this analysis. In developing the spanning tree a nearest neighbor algorithm was used. That is, the spanning tree was built by first selecting those two scores with the highest correlation as reflected in the correlation matrix of eleven selected FAOBC grades. At the second step the score which had the highest correlation with either of those two scores was selected. Next, the item with the highest correlation with any of the previously selected scores was selected and so on. The lines connecting the spanning tree represent an organization along the strongest connections.

Once a spanning tree has been developed, the components are hierarchically arranged by the magnitude of the correlations at the connection points to develop an hierarchical tree. A spanning tree and resultant hierarchical tree for eleven selected component grades in FAOBC were structured from the FAOBC 12-78 data. Those items are graphically portrayed in Figure 2-9. Since FAOBC Final Grade is a weighted average of 19 component grades, a spanning tree including this score would necessarily be biased in the direction of the component grades clustering close to the final grade. Similarly, if individual shoot scores or data which directly influenced those scores were included, they would be expected to be connected to the GØ-0211 Observed Fire score.

Inspection of the spanning tree in Figure 2-9 shows that six of the eleven grades cluster around the GD-0202 score which, like GD-0203 and GD-0204, is from a written gunnery department exam emphasizing fire direction procedures. The four other items connected to the GD-0203 score are two tactics exams, TB-0201 and TB-0202; a communications exam, CC-0201; and a test on the FADAC computer, GD-0205. One should note that the map reading and navigation exam AA-0201, a performance based exam, and the observed fire practical grade, GØ-0211 were not directly connected to the core of the spanning tree.

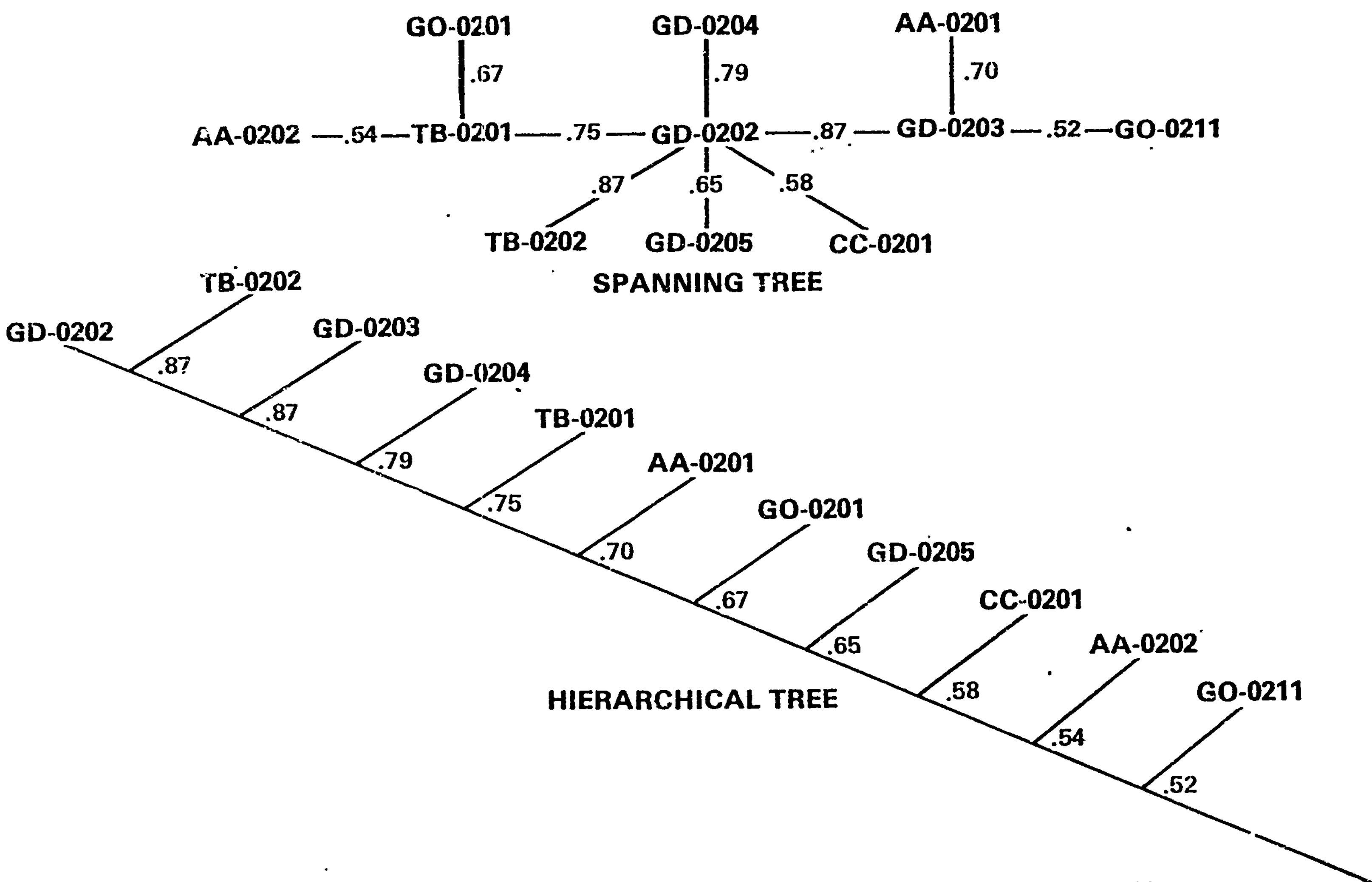


FIGURE 2–9 SPANNING TREE AND HIERARCHICAL TREE ILLUSTRATING RELATIONSHIPS AMONG CANDIDATE CRITERON MEASURES.

One may also note that in the hierarchical tree that the GØ-0211 score had the lowest connecting correlation of the components of the tree. This is not to imply that GØ-0211 was not related to the other scores. Indeed, one can readily educe from the spanning tree that a relationship between this score and the others existed, but GØ-0211 was not as closely associated with the other items as those items were with each other.

Table 2-7 shows the multiple correlations of the eleven selected grades with FAOBC Final Grade. They were necessarily related since OBC final grade was a weighted mean of the component grades. (The percentage of the final grade contributed by the eleven selected components was also shown in Table 2-7.) Interestingly, the GØ-0211 score had the strongest weighting factor but also the second weakest correlation. Because of its heavy weighting in the computation of final grade, one could anticipate a priori GØ-0211 to have one of the highest correlations with FAOBC final grade.

Inspection of the spanning tree, hierarchical tree, and correlations with FAOBC Final Grade suggested, for criterion selection, that the GØ-0211 score was likely to reflect a set of skills and abilities which was less redundant with those skills and abilities reflected in the other test scores or the final grade which combined all of them. The practical importance of this finding is that, from a quantitative point of view, <u>the GØ-0211 score emerged as a reasonably strong criterion even when FAOBC final grade is to be used as a criterion.</u>

The direct performance measure, RMD was examined as a possible criterion measure becuase it directly sampled a required FO performance Letchworth, Ragan, Stansell, and Huckabay (1979) attempted to develop predictive models of FO performance using self location and target location RMD at several stations as criteria. They regressed these measures on Lorge Thorndike (non-verbal incelligence) scores, (STEP) mathematics achievement scores and measures of cognitive style on a field dependence-independence dimension, trait anxiety, and visual

Table 2-7. CORRELATIONS OF ELEVEN SELECTED UNWEIGHTED COMPONENT GRADES WITH OBC FINAL GRADE

Grade	R	Percentage of Final Grade
GD-0202	.88	8.0
GD-0203	.86	8.0
TB-0201	.82	9.0
GD-0204	.81	7.0
GØ-0201	.74	5.0
AA-0201	.72	3.8
TB-0202	.72	9.0
GD-0205	.70	2.5
CC-0201	.65	2.0
GØ-0211	.61	12.5
AA-0202	.57	3.2

versus haptic perceptual style. A stepwise variable selection procedure was used. Factors entering their equations in their model building activity are summarized in Table 2-8. Since a low criterion of predictor acceptance (an F value of 1) had been used in building those models and since the actual models were not reported, the data analyzed by Letchworth et al. (1979) were subjected to a new multiple regression analysis. Summary results of the new analysis are included in Table 2-8 with the models indicated. The present analysis revealed that fewer items were included in each model. When averages were regressed on the predictors, only the Lorge Thorndike score entered the equation. That this index of math aptitude and general intelligence entered the equation is entirely consistent with what was reported about mathematics factors earlier. There is no indication of a major effect of the cognitive factors on the criteria examined.

This target location measure, RMD, was one of the eight FO performance based measures analyzed by the WSTEA-I team (1977). They attempted to use this measure as a criterion measure for a predictive model of post Field Artillary School FO performance. Their conclusion was, "Data gathered during field testing were not found useful for the construction of a model for use in identifying or predicting which Basic Course students would be the most successful forward observers." (p. 8) Despite this, we sought to use target location error (RMD) as a criterion measure because of its obvious face validity. Since scores collected only at Fort Sill were used, some of the factors cited as creating noise in the data set, e.g. range differences should be minimized.

The data for the SW gunnery exercise (mobile shoot) were selected for analysis because this shoot was considered to be the most realistic shoot. It approximates actual FO conditions better than the other shoots, and it occurs late enough in FAOBC so students should be beyond making many procedural errors and have the benefit of more general information. These data were correlated with the individual items from Section A of the FOPPQ to see if any items stood out as predictors of this criterion measure. Only chance level correlations were noted.

TABLE 2-8 COMPARISON OF REGRESSION ANALYSES FROM OKLAHOMA UNIVERSITY STUDY* WITH ALTERNATE ANALYSES OF THE SAME DATA

	OKLAHOMA UNIVERSITY		NEW ANALYSIS		
	R^2	Factors** (In Order of Selection)	R^2	Factors** (In Order of Selection)	Model
SELF LOCATION					
Station 1	.216	Lorge Thorndike Visual-Haptic STEP FD-FI	.213	Lorge Thorndike X_1 Visual Haptic X_2	$Y_{S1} = {}_0 + {}_1X_1 + {}_2X_2 +$ $Y_{S1} = 794.0 - 10.2X_1 - 14.1X_2$
Station 2	.096	Anxiety STEP Visual-Haptic FD-FI Lorge Thorndike	.138	Anxiety X_1 STEP X_2	$Y_{S2} = {}_0 + {}_1X_1 + {}_2X_2 +$ $Y_{S2} = 1120.6 - 5.3X_1 - 2.9X_2$
Station 3	.277	Lorge Thorndike Anxiety Visual-Haptic FD-FI STEP	.256	Lorge Thorndike X_1 Anxiety X_2 Visual-Haptic X_3	$Y_{S3} = {}_0 + {}_1X_1 + {}_2X_2 + {}_3X_3 +$ $Y_{S3} = 174.5 - 4.6X_1 + 4.6X_2 + 8.5X_3$
All 3 Stations			.274	Lorge Thorndike X_1	$Y_{self} = {}_0 + {}_1X_1 +$ $Y_{self} = 409.1 - 5.6X_1$

*Letchworth, G. A., Ragan, T. V., Stansell, V., Huckabay, K., Evaluation of Forward Observers. *Fort Sill, Oklahoma:* Department of Evaluation, ACN 32750, March 1979.

**Notes on units being used:

- o Y Values are in meters so a decrease (negative value) indicates an improvement in performance.
- o Visual (Low Values) Haptic (High Values)
- o Field Dependence (FD) (Low Value X's) Field Independence (FI) (High Value X's)
- o For all other independent variables, a larger score represents more of that characteristic or a higher score.

TABLE 2-8 COMPARISON OF REGRESSION ANALYSES FROM OKLAHOMA UNIVERSITY STUDY* WITH ALTERNATE ANALYSES OF THE SAME DATA (CONT'D.)

	OKLAHOMA UNIVERSITY		NEW ANALYSIS		
	R^2	Factors** (In Order of Selection)	R^2	Factors** (In Order of Selection)	Model
TARGET LOCATION					
Station 1	.301	Lorge Thorndike Visual-Haptic FD-FI Anxiety STEP	.274	Lorge Thorndike X_1 Visual-Haptic X_2	$Y_{T1} = {}_0 + {}_1X_1 + {}_2X_2 +$ $Y_{T1} = 1729.3 - 17.4X_1 - 21.2X_2$
Station 2	.215	FD-FI Lorge-Thorndike Anxiety Visual-Haptic STEP	.160	FD-FI X_1	$Y_{T2} = {}_0 + {}_1X_1 +$ $Y_{T2} = 1138.8 - 45.3X_1$
Station 3	.228	Lorge Thorndike Visual-Haptic FD-FI Anxiety STEP	.200	Lorge Thorndike X_1 Visual-Haptic X_2	$Y_{T3} = {}_0 + {}_1X_1 + {}_2X_2 +$ $Y_{T3} = 1461.3 - 21.6X_1 + 29.3X_2$
All 3 Stations			.290	Lorge Thorndike X_1	$Y_{Target} = {}_0 + {}_1X_1 +$ $Y_{Target} = 1653.1 - 19.9X_1$

*Letchworth, G. A., Ragan, T. V., Stansell, V., Huckabay, K., Evaluation of Forward Observers. Fort Sill, Oklahoma: Department of Evaluation, ACN 32750, March 1979.

**Notes on units being used:

- o Y Values are in meters so a decrease (negative valve) indicates an improvement in performance.
- o Visual (Low Valves) Haptic (High Valves)
- o Field Dependence (FD) (Low Valve X's) Field Independence (FI) (High Valve X's)
- o For all other independent variables, a larger score represents more of that characteristic or a higher score.

It was decided, then, to take a closer look at the SW data. A frequency distribution of the OBC 12-78 SW RMD data was constructed and is shown in Figure 2-10. Class intervals of 100 meters were used on the abscissa. It was apparent that the distribution was not Gaussian. The distribution is skewed right and is somewhat bimodal. One of the important assumptions of linear regression is, of course, that the distribution underlying the response measure be normally distributed. For practical purposes a distribution which tends toward normality will suffice. The most extreme values on the SW RMD score, those over 3000 meters, were set back to 3000 and correlations with FOPPQ Section A items were once again computed. Again the data were less than clear although suggestions of some relationships appeared. These were that mathematics courses completed and Boy Scout experience both correlated with SW target location performance. When correlations of Section A items with log transformed SW RMD data were computed, only chance level relationships were noted. This led to a decision not to attempt further model building to predict this measure.

Several reasons are suggested for this lack of success with the RMD criterion measure for performance modeling. The basic shape of the distribution and the large variance of the RMD values were not unique to the SW shoot data for FAOBC 12-78. Inspection of SW data from several classes and the UM Gunnery Exercise (walking shoot) data for several FAOBC classes suggests a similar phenomenon. The frequency distributions in Figure 2-11 reveal this. Each RMD, whether from the UM or SW gunnery exercise used a single observation for each student. This procedure necessarily yielded data with greater variability than would a mean of several observations. Extraneous factors such as weather, target difficulty, observer to target (OT) distance, and the order in which the student called fire tended to be magnified when single points were analyzed[1]. The extraneous factors tended to be washed out when

[1]It should be mentioned also that the order in which a student shoots within a particular gunnery exercise can have a dramatic effect on his performance. In observing live fire exercises, it was found that the first student to shoot has less time to familiarize himself with the terrain, and he does not have the benefit gleaned by students firing later in the exercise of learning from others' errors in target location.

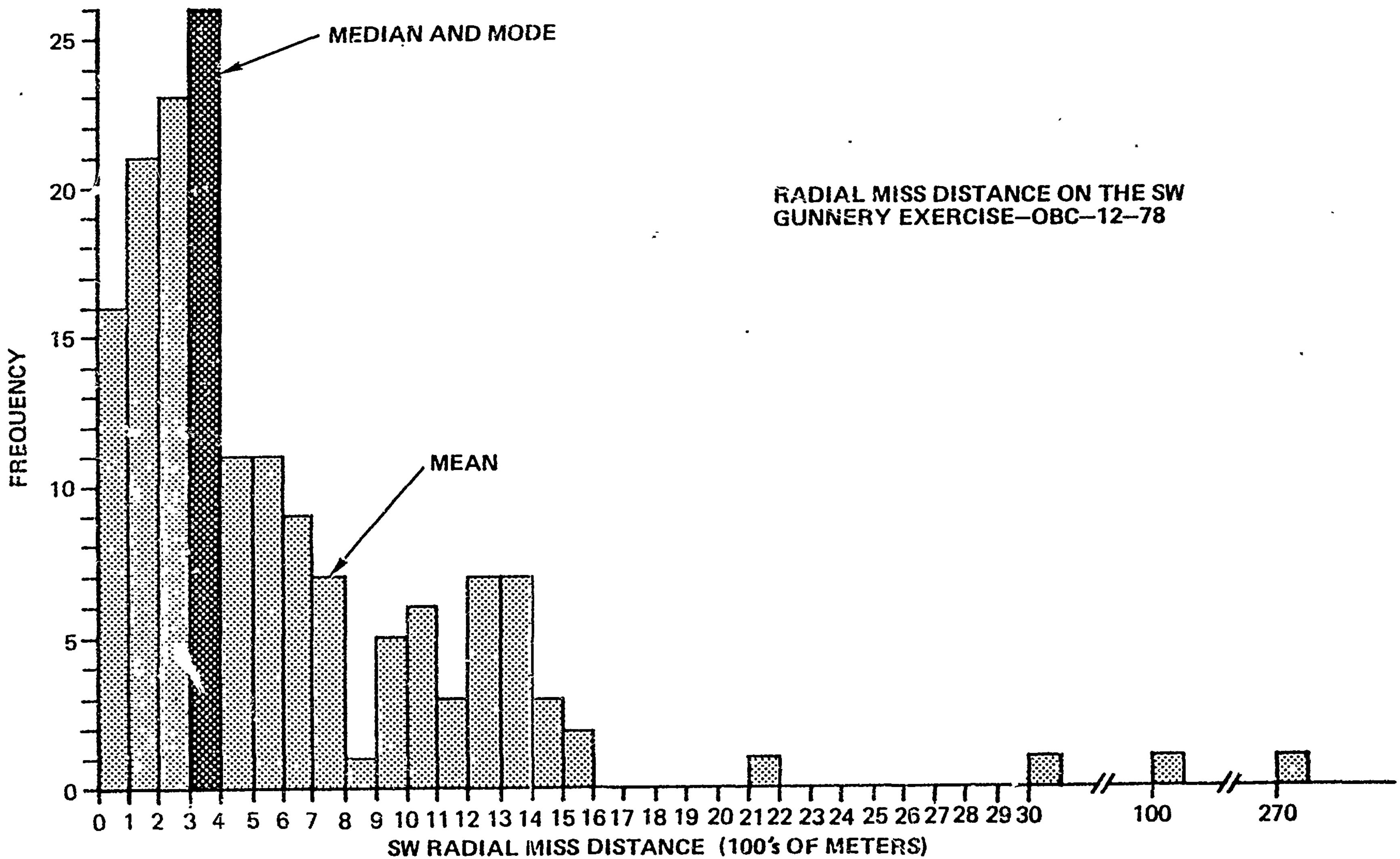


FIGURE 2—10 FREQUENCY DISTRIBUTION OF THE OBC—12—78 RADIAL MISS DISTANCES FOR THE SW OBSERVED FIRE EXERCISE.

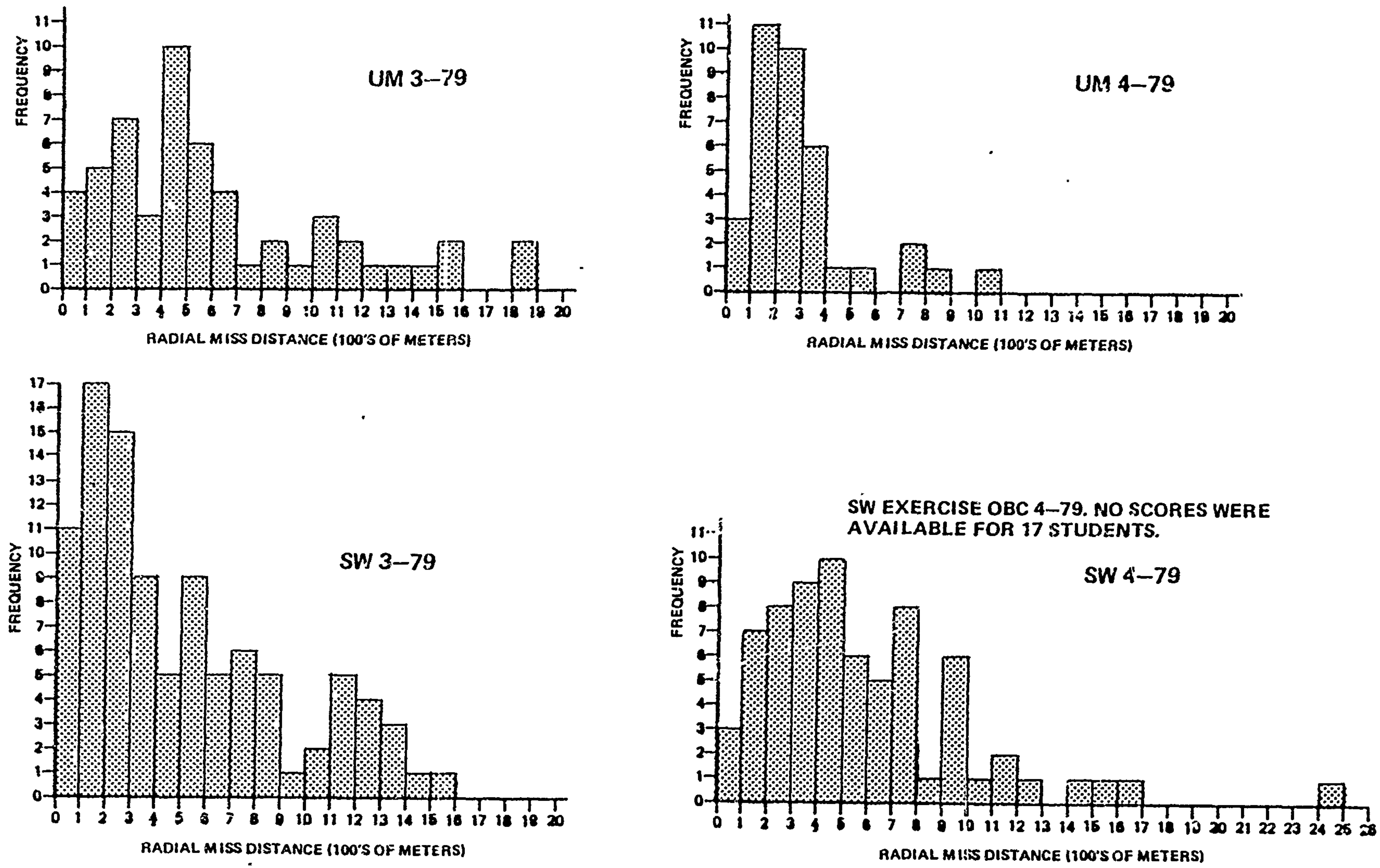


FIGURE 2–11 FREQUENCY DISTRIBUTIONS OF OBC 3–79 AND OBC 4–79 RADIAL MISS DISTANCES FOR THE UM AND SW OBSERVED FIRE EXERCISES.

an average of several scores was used. If a single score was used, some estimate of covariates, such as the relative difficulty of the firing mission, should reduce the variability in the primary scores.

The former procedure (averaging) was considered, but examination of the data set revealed that all students do not have RMD values for all shoots. Because of this, another problem emerged. One student might have four shoot scores including a walking shoot on the West range and no mobile shoot on the East range; whereas another student might have the opposite. Because of the dramatic differences in range difficulty (the East range at Fort Sill provided fewer cues to the student for self location and target location than the West range) such a procedure was expected to introduce yet another source of variability.

Estimates of relative difficulty of the missions could be obtained from instructors but this approach was rejected because instructors consider target difficulty, implictly or explictly, when assigning the shoot scores for each mission. The observed fire grade, GØ-0211, necessarily included some of this instructor adjustment. Despite this, the GØ-0211 grade remained the best available FO performance criterion because it was an estimate of OBC student firing skills which was less susceptible to extraneous factors than other measures such as target location error on the UM or SW exercises. The GØ-0211 score necessarily included, to some extent, an element of subjectivity, but this variance was, on the whole, tolerable since there was no suggestion of systematic bias noted in observation of the firing exercises or from student comments on the Training Evaluation Questionnaires (TEQ) completed by three FAOBC classes.

Performance Modeling. Following the criterion selection process, several interim analyses were completed prior to the development of the predictive models. These interim analyses were conducted on FAOBC 12-78 data. First, an item analysis was completed in which individual items from the FOPPQ were correlated with the GØ-0211 score. Second, factor analysis was performed. In order to hold correlation matrices to

manageable sizes and since this was an interim step, three separate factor analyses were performed. A varimax rotation was used. One was completed on Section A, another on scalable items from Sections B and C, and the third on Sections D and E[1]. Items from Sections B and C which were not included in the factor analysis were individually compared according to various scoring schemes to determine which would work best for that item. For example, item C2 which pertained to first branch choice was analyzed with each branch choice separately; Artillery versus all other branch choices; and Artillery, other NonCombat, and a third category consisting of Infantry, Armor, Combat Engineer, Finance, and Adjutant General. For descriptive purposes, individual responses were of value; but for predictive purposes, the categorization scheme, Artillery versus all other branch choices, worked well and thus was used.

The factor analyses were performed to identify redundancies among test items and as an aid in reducing the total set of possible predictors to a more easily manipulated and interpreted set. Just as correlation coefficients for individual items with the GØ-0211 score had been determined during the item analysis activity, correlations between factors and the GØ-0211 criterion measure as well as other OBC grades were computed.

In the interest of retaining simplicity, questionnaire items which loaded heavily on certain factors were identified and simple counts of those items were entered into the regression. By using counts instead of factor weights, greater ease in scoring the test was achieved. Instead of requiring the use of a powerful computer, simple scoring keys can be used. If a computer is available, the scoring can still be done by machine. Differences in the predictability of the model with counts versus factor weights are expected to be slight, whereas, gains in simplicity were expected to be great. An example of the simpler technique is evident in the "Sports" score which was used. Six items from

[1]The reader is referred to page 2-2 for a description of the FOPPQ.

Section A made up this score. They were A1-8, skeet or trapshooting; A1-20, hiking; A1-23, golf; A1-25, baseball; A7-4, participating in sports; and A7-5, observing sports. If an individual answered affirmative on all of these items, he scored a six on this simple scale.

Some items were analyzed using dummy variables, categorical variables created to specify classes when a continuum is neither available nor appropriate. Dummy variables are frequently used to sort effects of ordinal factors when higher scaling techniques are not appropriate or to sort the effects of a nominal variable such as source of commission. If three categories were chosen, ROTC, USMA, and other, and if an individual were an ROTC officer, he would receive a value of 1 in the ROTC vector and a value of zero for each of the other categories. Thus, in a regression model the difference would be picked up but no ordinal scaling assumptions (which were not appropriate here) would be detected. An example of the use of dummy variables in the present modeling effort was the Boy Scouts question which was A3 on Developmental Form A. By using dummy (binary) variables, the impact of each rank in Boy Scouts could be sorted separately without an artificial penalty or benefit for not being in scouts. Such an artificial penalty would have emerged if not being a scout had been assigned a scale position lower than tenderfoot on a dimension of Boy Scout rank.

Many combinations of potential predictors were regressed on GØ-0211 prior to selecting the set of predictors which comprise the models reported here. In the model building activity, some predictors effectively displaced others which contained redundant information. It was apparent from even a cursory examination of the data that mathematical aptitude was an important predictor. This was reflected in the analysis of items such as A4 which asked which mathematics courses had been completed. As was presented in Table 2-1, having completed calculus correlated with the GØ-0211 score, r =.18. The strong effect of mathematics aptitude was also reflected in the Lorge Thorndike intelligence test scores and the STEP scores. When all of the mathematics predictors were in the model, the variance due to this factor was

distributed among them. When one or more of those factors was removed, however, the total variance previously accounted for by all of them was explained by the math aptitude predictors remaining in the model. After trying several combinations, it became clear that STEP reflected this aptitude as a proxy for other math predictors. It stood in and reflected most of the effects of all of the math predictors. Thus STEP was included in the models reported below.

Models were built and initially validated using data for students in the FAOBC 12-78 class and cross validated on data collected from students in FAOBC 1-79 and subsequently on data collected from students in FAOBC 4-79. The analysis of the data from FAOBC 4-79 also included a comparison of long and short forms of the FOPPQ which is to be discussed later. Double cross validation procedures were used, which consisted of separately building the best model for each of two samples and cross validating each model on the other sample. Thus a model constructed on FAOBC 1-79 data was validated on data collected from FAOBC 12-78.

When comparing the adequacy of fit of two or more models, one could consider as best either the one with maximum R^2 or the one with the minimum standard error. Generally, the two measures will select the same model, but where this would not be true, we would assign more importance to the standard error. This is because the standard error, unlike R^2, takes account of the degrees of freedom of the model error and thereby avoids the pitfall of inflating the estimate of variation attributable to the predictor variables. Thus, the preferred model will be the more robust in cross validation, with respect not only to standard error, but R^2 as well. In other words, our results are more likely to be repeatable with new data.

Scores below 69 were set to 69. This was done primarily because the discontinuties in the data are exaggerated for the failing grades in contrast to the passing grades, suggesting that differences between the failing students are similarily exaggerated (Draper and Smith, 1966). The transformation of the scores also reduces the standard error of the

predictive models. The value, 69, was chosen not only because it was one point below passing scores, but also because some exploratory regression analysis showed that predicted scores were rarely below that value.

The first predictive model constructed for the Observed Fire score

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+ \dots +\beta_{29}X_{29}+\varepsilon \qquad (1)$$

where Y is the GØ-0211 grade, and the predictors, in order of inclusion in the model, are as shown in Table 2-9. This model yielded an R^2 of approximately .48. Items from the Forward Observer Personal Profile Questionnaire included in the model were of three types. First was the six point sports scale described earlier, second were items treated as dummy variables, and third were items from Sections D and E of the questionnaire. Items in Section D and E were scaled on a five point dimension ranging from Strongly Agree (1) to Strongly Disagree (5). To estimate an individual's predicted GØ-0211 score, one would read values from Table 2-9 starting with the constant (48.841) and add .129 times the STEP score, .846 times the Sports Score, and so forth. In constructing the model relative effects of the units associated with an item were considered. For the dummy variables in the Urban, Suburban, Rural item, only one response was possible. If Urban were chosen, 4.847 would be subtracted in estimating the GØ-0211 grade, if Suburban were chosen 1.274 would be subtracted, and if Rural were chosen no addition or subtraction would be required. For a Section D or E item, one simply takes the scale value of the response to a particular item, e.g., a 2.0 for Agree and multiples it times the $\hat{\beta}$ for that item. A scoring example will be provided with a later regression model.

Since Section D and E items are rated from Strongly Agree (1) to Strongly Disagree (5), interpreting Section D and E items in the model at a descriptive level required great care because of the sign associated with the $\hat{\beta}$ value and possible reverse wording in the questionnaire item. Inspection of item D3 serves to illustrate this point. The Statement was, "Being an FO is a rewarding job." The sign on the $\hat{\beta}$ in Table 2-9 is negative which means that the more strongly the student disagreed

TABLE 2-9

SUMMARY OF THE MULTIPLE REGRESSION OF GO-0211 ON A SET OF PREDICTOR VARIABLES REPRESENTING 15 VARIABLE CATEGORIES: OBC 12-78

	VARIABLE DESCRIPTION		$\hat{B}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
	STEP	X_1	0.1292	18.03	9.72	.0649	.0649
	SPORTS	X_2	0.8457	20.54	5.51	.0739	.1388
B4	URBAN	X_3	-4.8467				
B4	SUBURBAN	X_4	-1.2744	6.37	4.55	.0459	.1847
B4	(RURAL)		0.0				
A3	NO RESPONSE	X_5	-4.9064				
A3	TENDERFOOT OR SECOND CLASS	X_6	-4.4573				
A3	FIRST CLASS	X_7	-5.9934	3.99	3.92	.0718	.2565
A3	STAR OR LIFE	X_8	-3.0124				
A3	EAGLE	X_9	-0.4164				
A3	(NO BOY SCOUTS)		0.0				
	D3	X_{10}	-1.6167	7.48	5.54	.0269	.2834
	E2	X_{11}	1.2102	6.81	4.35	.0245	.3079
B25	NO RESPONSE	X_{12}	-12.3447				
B25	NO SINGLE AREA	X_{13}	-5.2254				
B25	MATH - SCIENCE - ENGR	X_{14}	-0.7345				
B25	BIOLOGY - PHYSIOLOGY	X_{15}	3.0504				
B25	ENGLISH - JOURNALISM	X_{16}	1.7473	2.34	2.29	.0758	.3837
B25	BUSINESS	X_{17}	0.4151				
B25	FOREIGN LANGUAGE	X_{18}	-2.6021				
B25	HISTORY - POLITICAL SCIENCE	X_{19}	-2.9571				
B25	PSYCHOLOGY - EDUCATION	X_{20}	-3.5917				
B25	(OTHER)		0.0				
C8	NO RESPONSE	X_{21}	2.3568				
C8	OTHER THAN REFERENCE	X_{22}	-2.4169	3.54	3.67	.0254	.4091
C8	(INADEQUATE PERFORMANCE BY FO)		0.0				
	D5	X_{23}	-1.5584	4.57	7.18	.0165	.4256
	D11	X_{24}	0.8645	2.63	3.11	.0095	.4351
	D16	X_{25}	-1.0299	3.44	2.70	.0124	.4475
	D10	X_{26}	-0.8588	2.14	2.77	.0077	.4552
	E5	X_{27}	1.1756	2.54	2.60	.0091	.4643
	E10	X_{28}	0.7929	2.07	2.10	.0075	.4718
C2	ARTILLERY	X_{29}	1.3523	1.60	1.60	.0057	.4775
C2	(OTHER)		0.0				
	INTERCEPT		48.8407				

with this statement, the lower his estimated GØ-0211 score would be. On the average, then, one who strongly disagreed with the D3 statement would be expected to score over six points lower on the GØ-0211 grade than an individual who strongly agreed. The summary result for D3 was that those individuals who agreed that being an FO was a rewarding job tended to score higher on the GØ-0211 observed fire grade.

As an aid to the reader, Table 2-10 includes the eight items from Section D and E in the model presented in Equation 1, the direction of the effect, and a statement which suggested the appropriate interpretation.

Discussions with instructors at the Field Artillery School suggested that a substantial deficit in map reading and terrain association skills was typical of the FAOBC population. This seemed to require predictor variables which reflected map reading performance. Students are assumed to possess the requisite map reading skills prior to FAOBC training, but it was clear that wide differences existed along this dimension. Ideally, from a personnel selection point of view, one would want a pre-FAOBC measure of map reading ability which would clearly reflect the ability to apply principles to real terrain, i.e., a job sample test.

To develop and administer such a test was beyond the scope of this effort, but a performance based measure (potential predictor) was selected. This measure was typically recorded on the fourth day of FAOBC training. The utility of this measure as a predictor should have substantial correspondence with the utility of a similar job sample test which could easily and inexpensively be given prior to FAOBC. The measure selected was the score on the map reading practical examination, AA-0201. That test consists of self and target location measures and requires the application of terrain analysis skills.

An independent and very strong argument could be made for using a job sample test early in training as a predictor of later performance (training or beyond). This approach has shown very good results.

TABLE 2-10

Aid to interpretation of FOPPQ Section D items included in regression models

	Item	Sign of $\hat{\beta}$ from Table A	Interpreted Direction of Effect on GØ-0211
D-3	Being an FO is a rewarding job.	-	Those who agree that being an FO is rewarding tend to perform better.
D-5	Less time should be spent on FO training and more on career related/administrative skills training.	-	Those favoring more emphasis on career related/administrative skills tend to perform better.*
D-10	Sometimes in combat your own command and control can be your worst enemy.	-	Those who agree tend to perform better.
D-11	Training to be an FO in peacetime is of reduced importance since officers may spend much of their time performing administrative functions.	+	Those noting the importance of training FO's in peacetime tend to perform better.*
D-15	A good FO will spend as many hours as he can practicing FO tasks.	-	Those who agree tend to perform better.**
E-2	I would rather be thought of as athletic than smart.	+	Those who prefer to be thought of as smart perform better.
E-5	People often say I'm too slow in making up my mind.	+	Those who make up their minds more quickly tend to perform better.
E-10	What happens to me is my own doing.	+	Those who recognize some external control tend to perform better.*

*This interpretation is consistent with the sign shown, but there is some doubt about the direction of the sign.

**When OBC Final Grade is the dependent variable the direction of the effect appears reversed.

Long and Varney (1975) reported the successful application of the job sample approach to selection in their discussion of a pilot selection program that was developed for the Air Force Human Resources Laboratory at Lackland Air Force Base. A five-hour job sample of flying tasks was administered to 178 candidate flight students that were tested with the automated pilot aptitude measurement system (APAMS). APAMS consisted of two General Aviation Trainers (GAT-1s), a Varian 620P minicomputer, and several audio/visual devices for presenting instruction and feedback. Performance measures collected with the APAMS were then correlated with later performance during undergraduate pilot training (UPT).

Results indicated that performance in all phases of training could be predicted from performance on the "learning sample". A high percentage of UPT students who were eliminated from all phases of training, including those eliminated for manifestation of apprehension, self-initiated elimination, as well as eliminees for flying training deficiency, could be identified by their performance on the job sample. Analyses indicated that use of APAMS as a selection tool could reduce attrition rates during UPT from 35 percent to less than 10 percent.

Recently, MDAC-St. Louis developed a similar approach to helicopter pilot selection for the Army called the Proficiency-based Aviator Selection System (PASS) which utilized the job sample technique (Marco, Bull, and Vidmar, 1978). An evaluation of the predictive validity of PASS is currently underway; however, the preliminary results look very promising. Both studies suggest that the use of a simulator coupled with a job sample measurement system is an effective method of selecting individuals with the requisite abilities to learn the task. Additionally, for FAOBC, it may also be an effective way of identifying individuals who may experience difficulty in training in order to provide the additional instruction required for them to successfully complete the program.

Map Reading Predictor. The AA-0201 score was added as a predictor to the predictive model of Observed Fire performance. The regression of GØ-0211 on the predictors in Equation 1 plus the AA-0201 score yielded the model

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\ \cdots\ +\beta_{30}X_{30}+\varepsilon \qquad (2)$$

which is summarized in Table 2-11. The addition of AA-0201 was not only statistically significant ($p<.01$), but it raised the multiple R^2 to approximately .52. The implications of this increase in the predictive ability of the model with the inclusion of this performance-based map reading score are important especially in light of other findings regarding the map reading ability of FAOBC students. These findings are discussed in more detail after relevant data from the task analysis are presented.

As an interim step to finding a sound but not cumbersome predictive model, the set of predictors was reduced to those three items which had very strong impact on the larger models. The reduced model constructed on the FAOBC 12-78 data (3) is summarized in Table 2-12. The values of R^2 for these two models are .18 and .28 respectively. The same three predictors along with the AA-0201 grade yielded the model

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\varepsilon \qquad (3)$$

which is summarized in Table 2-13. As with the larger models, when the AA-0201 score was added to the model the predictive validity rose sharply.

Up to this point, only model building activities have been described. Clearly model building is an art guided by the results of preliminary statistical analyses but not forced by them. It should be noted that a large number of models could be constructed using the present data, and those models which have been created reflect educated guesses as well as statistical analyses. The value of a model is only established when that model is cross validated on a second independent sample. All models constructed on FAOBC 12-78 data were cross validated on FAOBC 1-79 and the three and four element models were subjected to double cross validation procedures; the FAOBC 12-78 models were validated on

TABLE 2-11

SUMMARY OF THE MULTIPLE REGRESSION OF GO-0211 ON A SET OF PREDICTOR VARIABLES REPRESENTING 16 VARIABLE CATEGORIES: OBC 12-78

	VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
	STEP	X_1	0.0767	19.34	3.20	.0649	.0649
	SPORTS	X_2	0.7232	22.04	4.28	.0739	.1388
B4	URBAN	X_3	-4.6301				
B4	SUBURBAN	X_4	-1.4717	6.84	4.32	.0459	.1847
B4	(RURAL)		0.0				
A3	NO RESPONSE	X_5	-1.6361				
A3	TENDERFOOT OR SECOND CLASS	X_6	-3.7240				
A3	FIRST CLASS	X_7	-5.2319	4.28	2.89	.0718	.2565
A3	STAR OR LIFE	X_8	-3.9966				
A3	EAGLE	X_9	-0.8983				
A3	(NO BOY SCOUTS)		0.0				
	D3	X_{10}	-1.2530	8.03	3.48	.0269	.2834
	E2	X_{11}	1.2184	7.31	4.73	.0245	.3079
B25	NO RESPONSE	X_{12}	-4.6883				
B25	NO SINGLE AREA	X_{13}	-4.5164				
B25	MATH - SCIENCE - ENGR	X_{14}	-0.2904				
B25	BIOLOGY - PHYSIOLOGY	X_{15}	3.1316				
B25	ENGLISH - JOURNALISM	X_{16}	2.3260	2.51	1.73	.0758	.3837
B25	BUSINESS	X_{17}	1.2480				
B25	FOREIGN LANGUAGE	X_{18}	-2.1703				
B25	HISTORY - POLITICAL SCIENCE	X_{19}	-2.2570				
B25	PSYCHOLOGY - EDUCATION	X_{20}	-2.1317				
B25	(OTHER)		0.0				
C8	NO RESPONSE	X_{21}	1.6066				
C8	OTHER THAN REFERENCE	X_{22}	-2.2642	3.78	3.12	.0254	.4091
C8	(INADEQUATE PERFORMANCE BY FO)		0.0				
	D5	X_{23}	-1.5772	4.90	7.89	.0165	.4256
	D11	X_{24}	0.8541	2.02	3.26	.0095	.4351
	D16	X_{25}	-1.2183	3.69	4.03	.0124	.4475
	D10	X_{26}	-0.7533	2.30	2.39	.0077	.4552
	E5	X_{27}	0.8384	2.72	1.39	.0091	.4643
	E10	X_{28}	0.7764	2.22	2.16	.0075	.4718
C2	ARTILLERY	X_{29}	1.1713	1.72	1.28	.0057	.4775
C2	(OTHER)		0.0				
	AA-0201	X_{30}	0.1772	11.56	11.56	.0338	.5163
	INTERCEPT		50.0581				

TABLE 2-12

SUMMARY OF THE MULTIPLE REGRESSION OF GØ-0211 ON THREE PREDICTORS: OBC 12-78

VARIABLE DESCRIPTION			F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
STEP	X_1	.1233	13.49	9.45	.0649	.0649
SPORTS	X_2	1.2001	15.37	10.08	.0740	.1389
D3	X_3	-1.8190	7.92	7.92	.0381	.1770
INTERCEPT		48.7751				

TABLE 2-13

SUMMARY OF THE MULTIPLE REGRESSION OF GØ-0211 ON FOUR PREDICTOR VARIABLES: OBC 12-78

VARIABLE DESCRIPTION			F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
STEP	X_1	0.0210	15.65	.25	.0649	.0649
SPORTS	X_2	0.8784	17.83	6.08	.0740	.1389
D3	X_3	-1.4048	9.18	5.39	.0381	.1770
AA-0201	X_4	0.2568	28.30	28.30	.1175	.2945
INTERCEPT		57.6315				

FAOBC 1-79 data and the FAOBC 1-79 models[1] were validated on FAOBC 12-78 data. Table 2-14 presents the validity coefficients for both model building and cross validation samples. As would be expected, in the model building stage, those equations with more predictors yielded larger validity coefficients than equations with fewer elements. When the smaller set is a subset of the larger set, this will, necessarily follow. There were no such constraints on the cross validation process since the models are being applied to an independent sample. Normally one expects the validity coefficient R, to be smaller in cross validation than in model building. Generally, less shrinkage is indicative of a more robust model.

A simple example of how one would compute a predicted score for a particular student is provided for the model described in Table 2-13. Each obtained score is multiplied times the corresponding $\hat{\beta}$ value and those products and the intercept are summed to give a predicted value. Figure 2-12 illustrates this process and further clarifies handling of component elements. The components shown are the sports score and item D3, a five point scale item. The basic procedure illustrated in Figure 2-12 can be followed in computing a predicted score according to any one of the models presented in this section.

Half of the students in the FAOBC 4-79 cross validation sample were administered the FOPPQ Developmental Form A and the other half were administered a shortened version, Developmental Form B. The shortened version was developed to reduce test administration and processing time if the questionnaire were to be widely used, and to ensure that the predictive value of the items was not a pecularity due to item placement, i.e., context factors. Developmental Form B was created by eliminating some Developmental Form A items which proved to be redundant, items which did not obtain a distribution of scores for the FAOBC population, and items which did not show promise as predictors of FO performance. A copy of Developmental Form B is included in Appendix A.

---

[1]Construction of models using OBC 1-79 data was attempted and it augmented the primary modeling activity. Since, however, it was not central to the development of the predictive model it is reported in Appendix K.

TABLE 2-14

Summary of Validity Coefficients (R) for Three Samples*
With GØ-0211

No. of Predictors in Equation	Model Building		Cross Validation		
	OBC 12-78	OBC 1-79	OBC 12-78 Model on OBC 1-79 Data	OBC 1-79 Model on OBC 12-78 Data	OBC 12-78 Model on OBC 4-79 Data
16	.691 (.478)	.583 (.340)	.292 (.086)	-	.398 (.158)
15	.719 (.516)	.598 (.357)	.318 (.101)	-	.399 (.159)
4	.543 (.294)	.547 (.299)	.464 (.215)	.468 (.219)	.352 (.124)
3	.177 (.031)	278 (.077)	.258 (.066)	.163 (.026)	-

*Cell entries are R values. The values in parenthesis are R^2.

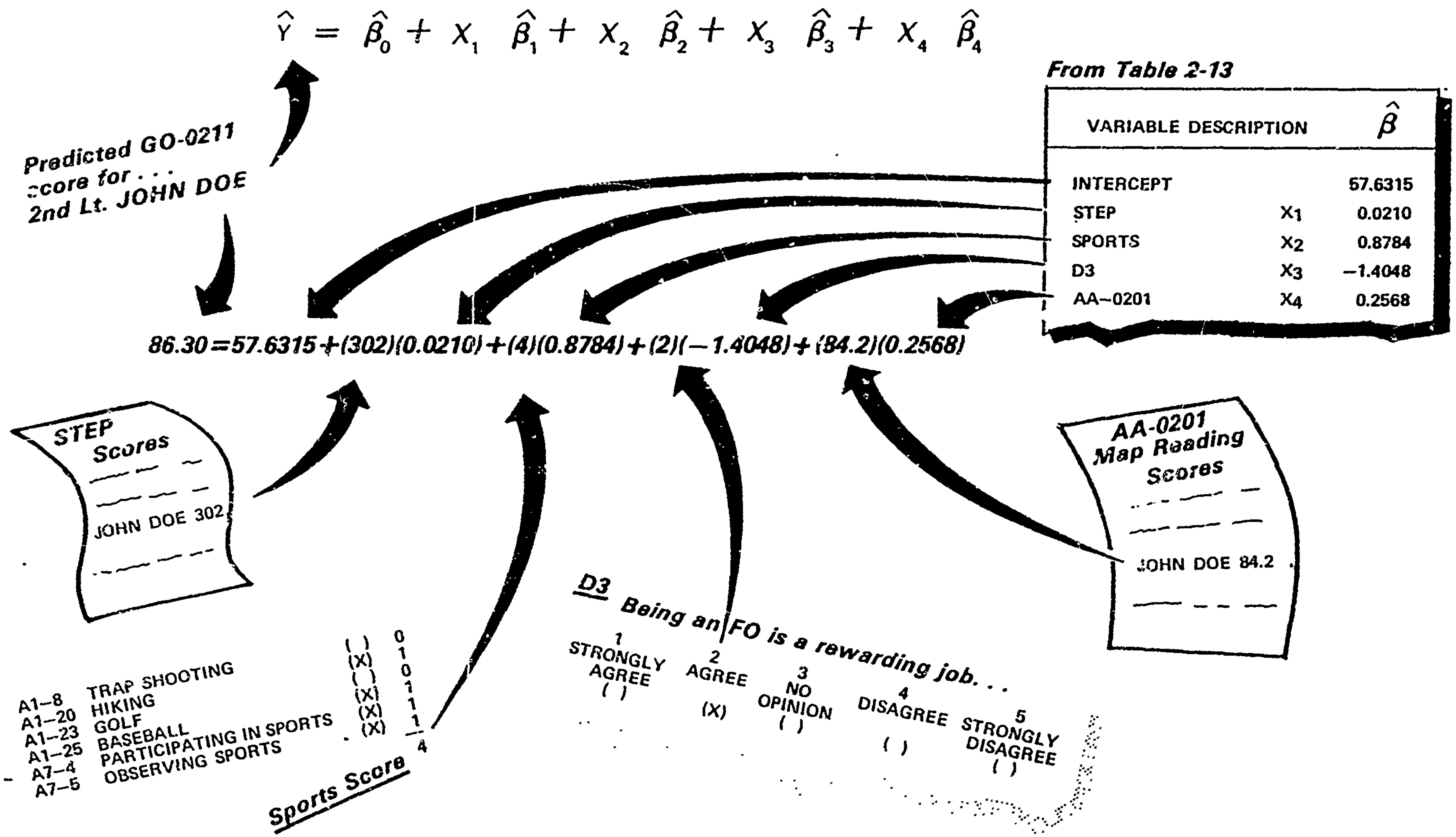


Figure 2–12. Example of the computation of a predicted score using the four element model for GO–0211 performance.

Responses obtained from FAOBC 4-79 for the two forms of the FOPPQ were compared and Chi Square values were computed when comparing items from the two forms, which were included in any of the models. Item C2 was the only item found to yield significantly different results $X^2(1)=6.6(P<.01)$ for the two forms. Since item C2 required a specification of branch choice, a clear and straightforward question, no practical significance was attached to that difference. For the cross validation on FAOBC 4-79 data, a single grouping of students completing Developmental Form A or Developmental Form B was used.

Models Constructed for Predicting FAOBC Final Grade

The development of models predictive of FAOBC Final Grade followed the same basic line as development of the models for the GØ-0211 Observed Fire Grade, but it was augmented by experience gained in building the previous models. The preliminary analyses indicated that a subset of the 15 predictor categories (29 predictor variables) shown in Equation 1 should also be the variables of interest when FAOBC Final Grade was the criterion. Following the logic that items predictive of a component (GØ-0211) of another score (FAOBC Final Grade) should also be predictive of that second score, those items which did not appear to have a direct relationship to FAOBC Final Grade were included and FAOBC Final Grade was regressed on the full set of predictors in Equation 1. The three items which were retained on this basis were D10, D11, and D16. The regression model obtained was

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+ \dots \beta_{29}X_{29}+\epsilon \qquad (4)$$

where Y is FAOBC Final Grade and the predictors are as summarized in Table 2-15. Note that once again that the STEP score, sports score, and D3 were strong variables. Item B25, best grades in college, and item E10 also contributed to this model. Just as it added significantly to the model of GØ-0211, AA-0201 improved the model of Final Grade. The model with the addition of AA-0201 essentially took the form of Equation 2 and is summarized in Table 2-16.

Reduced set (3 and 4 predictor) models were also constructed for FAOBC Final Grade. The three element model (see Table 2-17) was not

TABLE 2-15

SUMMARY OF THE MULTIPLE REGRESSION OF OBC FINAL GRADE ON A SET OF PREDICTOR VARIABLES REPRESENTING 15 VARIABLE CATEGORIES: OBC 12-78

	VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
	STEP	X_1	0.2573	87.49	38.60	.2554	.2554
	SPORTS	X_2	0.0822	7.45	0.05	.0217	.2771
B4	URBAN	X_3	-4.2965				
B4	SUBURBAN	X_4	-0.6962	3.70	3.91	.0391	.3162
B4	(RURAL)		0.0				
A3	NO RESPONSE	X_5	-6.6716				
A3	TENDERFOOT OR SECOND CLASS	X_6	-3.4216				
A3	FIRST CLASS	X_7	-3.4001	3.12	2.43	.0456	.3618
A3	STAR OR LIFE	X_8	-0.2234				
A3	EAGLE	X_9	0.3808				
A3	(NO BOY SCOUTS)		0.0				
	D3	X_{10}	-1.6782	6.63	5.98	.0194	.3812
	E2	X_{11}	0.8910	3.61	2.36	.0105	.3917
B25	NO RESPONSE	X_{12}	-34.9817				
B25	NO SINGLE AREA	X_{13}	-1.1169				
B25	MATH - SCIENCE - ENGR	X_{14}	-0.0643				
B25	BIOLOGY - PHYSIOLOGY	X_{15}	2.9176				
B25	ENGLISH - JOURNALISM	X_{16}	-0.2004	5.05	4.25	.1326	.5243
B25	BUSINESS	X_{17}	-1.9755				
B25	FOREIGN LANGUAGE	X_{18}	0.4009				
B25	HISTORY - POLITICAL SCIENCE	X_{19}	-0.9929				
B25	PSYCHOLOGY - EDUCATION	X_{20}	-4.2481				
B25	(OTHER)		0.0				
C8	NO RESPONSE	X_{21}	0.5233				
C8	OTHER THAN REFERENCE	X_{22}	-1.7262	1.78	1.51	.0104	.5347
C8	(INADEQUATE PERFORMANCE BY FO)		0.0				
	D5	X_{23}	0.6076	1.80	1.09	.0053	.5400
	D11	X_{24}	0.0265	0.01	0.00	.0000	.5400
	D16	X_{25}	0.6167	0.62	0.97	.0018	.5418
	D10	X_{26}	-0.4914	0.19	0.95	.0006	.5424
	E5	X_{27}	1.8021	6.47	6.13	.0189	.5613
	E10	X_{28}	0.7299	1.74	1.78	.0051	.5664
C2	ARTILLERY	X_{29}	2.0336	3.62	3.62	.0106	.5770
C2	(OTHER)		0.0				
	INTERCEPT		1.6579				

TABLE 2-16

SUMMARY OF THE MULTIPLE REGRESSION OF OBC FINAL GRADE ON A SET OF PREDICTOR VARIABLES REPRESENTING 16 VARIABLE CATEGORIES: OBC 12-78

	VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
	STEP	X_1	.1621	115.01	17.52	.255	.255
	SPORTS	X_2	-0.1398	9.79	.20	.022	.277
B4	URBAN	X_3	-3.9037	8.80	3.86	.039	.316
	SUBURBAN	X_4	-1.0540				
	(RURAL)		0.0				
A3	NO RESPONSE	X_5	-0.7420	4.10	.67	.046	.362
	TENDERFOOT OR SECOND CLASS	X_6	-2.0921				
	FIRST CLASS	X_7	-2.0193				
	STAR OR LIFE	X_8	-0.1947				
	EAGLE	X_9	-0.4930				
	(NO BOY SCOUTS)		0.0				
	D3	X_{10}	-1.0187	8.72	2.82	.019	.381
	E2	X_{11}	.9058	4.75	3.21	.011	.392
B25	NO RESPONSE	X_{12}	-21.0992	6.63	1.97	.133	.525
	NO SINGLE AREA	X_{13}	.1687				
	MATH - SCIENCE - ENGR	X_{14}	.7410				
	BIOLOGY - PHYSIOLOGY	X_{15}	3.0648				
	ENGLISH - JOURNALISM	X_{16}	0.8489				
	BUSINESS	X_{17}	-0.4653				
	FOREIGN LANGUAGE	X_{18}	1.1839				
	HISTORY - POLITICAL SCIENCE	X_{19}	0.2765				
	PSYCHOLOGY - EDUCATION	X_{20}	-1.6009				
	(OTHER)		0.0				
C8	NO RESPONSE	X_{21}	-0.8370	2.34	1.27	.010	.535
	OTHER THAN REFERENCE	X_{22}	-1.4494				
	(INADEQUATE PERFORMANCE BY FO)		0.0				
	D5	X_{23}	.5735	2.37	1.28	.005	.540
	D11	X_{24}	.0076	0.01	0.00	.000	.540
	D16	X_{25}	.2751	0.81	.25	.002	.542
	D10	X_{26}	-0.3365	0.25	.58	.001	.543
	E5	X_{27}	1.1907	8.50	3.45	.019	.562
	E10	X_{28}	0.6999	2.29	2.15	.005	.567
C2	ARTILLERY	X_{29}	1.7055	4.76	3.34	.011	.578
	(OTHER)		0.0				
	AA-0201	X_{30}	.3213	46.62	46.62	.103	.681
	INTERCEPT		3.8652				

TABLE 2-17

SUMMARY OF THE MULTIPLE REGRESSION OF OBC FINAL GRADE
ON THREE PREDICTORS: OBC 12-78

VARIABLE DESCRIPTION			F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
STEP	X_1	.3053	62.96	55.74	.2553	.2553
SPORTS	X_2	.6319	5.36	2.69	.0217	.2770
D3	X_3	-1.7712	7.23	7.23	.0293	.3063
INTERCEPT		-2.0801				

TABLE 2-18

SUMMARY OF THE MULTIPLE REGRESSION OF OBC FINAL GRADE
ON FOUR PREDICTOR VARIABLES: OBC 12-78

VARIABLE DESCRIPTION			F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
STEP	X_1	0.1350	101.02	13.80	.2553	.2553
SPORTS	X_2	0.0966	8.60	0.10	.0217	.2770
D3	X_3	-1.0818	11.59	4.25	.0293	.3063
AA-0201	X_4	0.4273	104.39	104.39	.2639	.5702
INTERCEPT		12.6576				

particularly strong but when the AA-0201 predictor was included, the predictive validity of the models (see Table 2-18) increased dramatically and held quite well through cross validation for the FAOBC Final Grade (see Table 2-19). The 16 predictor category model appears to be the superior model but the four element model also appeared reasonable, and it should be somewhat simpler to use. However, because simple scoring was a forcing factor in developing all of these models, even the most complex model referenced in Table 2-19 could reasonably be scored without a requirement for sophisticated computer programming, nor is manual scoring, as illustrated earlier, out of the question.

Earlier, the importance of AA-0201, the Map Reading grade, was mentioned. This grade which was obtained on the fourth day of normal instruction appeared to be a good predictor of success in FAOBC. The effect was believed to be multifaceted, reflecting motivational components (if one scores low early in the course it might be more difficult to be motivated for later segments) skill components, and, undoubtedly, other factors. Since this test is given so early in FAOBC it is doubtful that it reflects what has been learned in FAOBC as much as it reflects pre-FAOBC training. This is particularly important in light of the fact that the present Course of Instruction (COI) for FAOBC does not include any map reading/land navigation instruction except for a 7 hour review of the basics which is conducted by the Counterfire Department during the first three days of FAOBC. One of the recommendations of the WSTEA-I (1977) study was that training of map reading skills in FAOBC be improved. The present findings were consistent with instructor comments that a portion of the lieutenants entering FAOBC do not have basic map reading, navigation, or terrain association skills. The strength of AA-0201 as a predictor probably comes from its ability to detect this difference early in FAOBC. The data suggested that identification of differential map reading skills might be an important step to achieving the recommendation put forth by the WSTEA-I group. This latter point is discussed in greater detail in the Training Analysis and Conclusion sections of this report.

TABLE 2-19

Summary of Validity Coefficients (R) for Three Samples*
With OBC Final Grade

No. of Predictors in Equation	Model Building		Cross Validation		
	OBC 12-78	OBC 1-79	OBC 12-78 Model on OBC 1-79 Data	OBC 1-79 Model on OBC 12-78 Data	OBC 12-78 Model on OBC 4-79 Data
16	.760 (.577)	.715 (.512)	.564 (.318)	-	.719 (.517)
15	.826 (.680)	.760 (.578)	.630 (.397)	-	.501 (.251)
4	.755 (.570)	.666 (.444)	.623 (.388)	.702 (.493)	.754 (.569)
3	.306 (.094)	.398 (.158)	.396 (.157)	.305 (.093)	-

*Cell entries are R values. The values in parentheses are R^2.

3.0 FO Task Analysis

The primary objective of the FO Task Analysis was the identification of the critical tasks an FO must complete in order to accomplish his mission. In designing the FO Task Analysis activity TRADOC Pamphlet 350-30 Interservice Procedures for Instructional Systems Development; Phase I: Analyze served as a source book and guide. It is important to note that task analysis is a process to an end, not an end product. As such, each task analysis must be tailored to the goals, needs, time allocation and financial resources of the individual project. With these factors in mind the task analysis methodology outlined in TRADOC Pamphlet 350-30 was modified.

TRADOC Pamphlet 350-30 outlines four basic procedures to be used in the conduct of a task analysis: (1) development of a tentative task list; (2) authentication of the task list; (3) validation of the task list; and (4) identification of subtasks, conditions, cues, and standards. It was decided to eliminate the identification of subtasks, conditions, cues, and standards from the FO Task Analysis because it was not our intent, within the scope of this program, to develop detailed behavioral objectives or instructional materials. Therefore, analyzing the FO job at the task level of specificity was felt to be sufficient for the identification of critical FO skills. The following section will summarize the procedures used in the FO Task Analysis.

Development of the Initial Task List

An initial task listing was developed by extracting FO and possible FO tasks from pertinent FAOBC texts and from direct observation of FO training activities. The FO relevant OBC texts and manuals included the following:

- o FAOBC Course of Instruction (COI)
- o Enlisted man MOS13F COI
- o Field Artillery Cannon Gunnery (FM 6-40)

- Field Artillery Target Acquisition: Battalion and Batteries FM 6-120)
- Map Reading (FM 21-26) and
- Special Missions - Fire Direction and Forward Observer Procedures (RN GD-DI)[1].

FM 6-30 which was released during the course of the present research was given less extensive coverage.

A second source of information consisted of classroom observations which included the Observed Fire Trainer (OFT) and the BT-33 simulators and field observations of a walking shoot on the East range, a walking shoot on the West range, a shack shoot using the Gun Direction Computer M18 (FADAC), and a mobile shoot. Additional information was derived from reviews of self-instructional audio-visual materials, interviews with counterfire/survey and gunnery instructors, and pertinent Field Artillery and FO literature. Once the tentative lists of FO tasks were developed, the lists were consolidated, subtasks and enabling tasks were eliminated, and a preliminary task categorization scheme was developed.

Authentication of the Task List

The preliminary list of 118 FO tasks was reviewed by 14 FAOBC instructors from the Gunnery, Counterfire, and Tactics and Combined Arms departments at the Field Artillery School at Fort Sill. Nine Gunnery Basic Branch instructors, five Counterfire/Survey instructors and five Tactics and Combined Arms Department instructors were interviewed either individually or in groups of two or three. Each instructor was asked to verify the completeness of the FO task inventory, to identify any additional tasks that may have been excluded, and to eliminate any non-FO tasks. Additionally, they were asked to comment on the criticality and difficulty levels of tasks relevant to their instructional areas with respect to both the operational and training environments.

[1] A list of tasks derived from these texts is included in Appendix D

In discussing the impact of task difficulty and criticality on combat and on training, the instructors surfaced a problem related to the interaction of task differences on several rating dimensions with combat scenarios. Several gunnery instructors pointed out that most of the training that was conducted in FAOBC was directed to a general European combat scenario. However, certain tasks such as terrain association and target location can be very difficult in a desert or jungle environment. The type, quality, and recency of the maps can also differ by geographical region or locale. Maps of Africa and the Far East were described as being incomplete, out-of-date, and, in some cases, of too small a scale to be adequately used. Interviews with other FAOBC instructors confirmed these combat scenario differences and identified other examples. Thus, a task that is seemingly very easy to perform in a European combat theater may receive very little emphasis or training in FAOBC. When the FO is placed in an operational environment where the task is very difficult to perform, he may experience great difficulty in performing the task if he can perform it at all. Because task performance in the European scenario may not be representative of other possible combat locales, it was decided to examine the effects of combat scenario on task difficulty in the FO Task Analysis.

Validation of the Task Listing

Sixty-nine tasks were retained in the final task list upon completion of the instructor review of the preliminary FO task list. Task validation was then conducted on this task list, (see Table 3-1 for a complete listing). In the task validation phase, interviews were conducted with 56 Field Artillery officers who were assigned as FO's or FIST Chiefs attached to operational units, or, who had recently performed in the FO role. Those participating in the FO Task Analysis included: 15 officers from the First Infantry Division (mech) at Fort Riley, Kansas; 15 from the 9th Infantry Division at Fort Lewis, Washington; and 26 from the 2d Armor Division and 1st Cavalry Division at Fort Hood, Texas. The officers were given instruction in how to complete the Task

TABLE 3-1. TASKS INCLUDED IN FO TASK ANALYSIS FORM

1. DECLINATE AN M2 COMPASS

2. DETERMINE DIRECTION USING AN M2 COMPASS.

3. DETERMINE DIRECTION USING BINOCULARS AND KNOWN REFERENCES.

4. CONDUCT A TERRAIN ANALYSIS.

5. READ A MILITARY MAP

6. ORIENT A MAP USING A COMPASS.

7. ORIENT A MAP BY TERRAIN ASSOCIATION.

8. DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION.

9. LOCATE AN UNKNOWN POINT ON A MAP BY RESECTION.

10. LOCATE POINTS USING A SURVEY

11. MEASURE GROUND DISTANCES ON A MAP.

12. LOCATE AN UNKNOWN POINT ON A MAP BY INTERSECTION.

13. MAKE A MAP RECONNAISANCE

14. PREPARE AND USE A TERRAIN SKETCH.

15. USE AN FDC PREPARED VISIBILITY DIAGRAM.

16. CONSTRUCT A VISIBILITY DIAGRAM.

17. PREPARE AND USE AN OBSERVED FIRE FAN.

18. USE PHOTOGRAPHS, PHOTO MAP MAPS OR PICTOMAPS AS A MAP SUBSTITUTE OR SUPPLEMENT.

19. NAVIGATE ON LAND BY FOOT.

20. NAVIGATE ON LAND FROM A VEHICLE.

21. NAVIGATE ON LAND WITHOUT ANY AIDS SUCH AS A MAP OR COMPASS.

22. SELECT AND OCCUPY OBSERVATION POSTS.

23. OBSERVE FROM A TANK-MOUNTED POSITION.

24. ACQUIRE TARGET(S).

25. RECOGNIZE/IDENTIFY TARGETS.

26. DETERMINE TARGET LOCATION BY POLAR PLOT.

27. DETERMINE TARGET LOCATION BY GRID COORDINATES.

29. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING OBSERVER/TARGET DIRECTIONS.

29. DETERMINE TARGET LOCATIONS BY SHIFT FROM A KNOWN POINT USING A HORIZONTAL SHIFT.

30. DETERMINE TARGET LOCATIONS BY SHIFT FROM A KNOWN POINT USING A VERTICAL SHIFT.

31. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A LATERAL SHIFT.

32. MEASURE AN ANGLE USING THE HAND AND FINGERS.

33. MEASURE AN ANGLE USING BINOCULARS.

34. MEASURE AN ANGLE USING AN AIMING CIRCLE.

35. MEASURE AN ANGLE USING BATTERY COMMANDER'S PERISCOPE.

36. USE DEGREES AS ANGULAR MEASUREMENTS.

37. USE MILS AS ANGULAR MEASUREMENTS.

38. DETERMINE DISTANCE BY FLASH-BANG METHOD.

39. DETERMINE DISTANCE BY ESTIMATION.

40. DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS.

41. DETERMINE AND USE GUN-TARGET LINE AS A SPOTTING LINE.

42. DETERMINE AND USE OBSERVER/TARGET LINE AS A SPOTTING LINE.

43. DETERMINE AND USE CARDINAL DIRECTION AS A SPOTTING LINE.

44. CHECK COMMUNICATIONS SYSTEMS.

45. REPORT POSITIONS TO FDC.

46. OPERATE OBSERVER'S RADIO AND WIRE EQUIPMENT IN FIRE DIRECTION CHANNELS OF THE FA BATTERIES.

47. USE THE CEOI TO DETERMINE CALL SIGNS, FREQUENCIES, NUMERAL CODE, AUTHENTICATION, AND ENCODING FOR THE GUIDED TEMPLATE.

48. USE PROPER RADIO-TELEPHONE PROCEDURES.

49. PREPARE AND TRANSMIT A CALL FOR FIRE.

50. SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGETS (FOR CANNONS).

51. SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGETS (FOR MORTARS).

52. REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING SUCCESSIVE BRACKETING PROCEDURES.

53. REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING HASTY BRACKETING PROCEDURES.

54. REQUEST AND ADJUST FIRE USING CREEPING PROCEDURES.

55. CONDUCT A PRECISION REGISTRATION.

56. CONDUCT A FIRE MISSION AS AN AERIAL OBSERVER.

57. CONDUCT A SUPPRESSIVE FIRE MISSION ON A TARGET OF OPPORTUNITY.

58. CONDUCT A FIRE MISSION USING SHELL ILLUMINATION.

59. REQUEST AND ADJUST A QUICK SMOKE MISSION.

60. CONDUCT AN IMMEDIATE SMOKE MISSION.

61. REPORT CONSEQUENCES OF FIRE-FOR-EFFECT ON TARGET.

62. REQUEST AND ADJUST NAVAL GUN FIRE.

63. REQUEST IMMEDIATE OR PRE-PLANNED CLOSE AIR SUPPORT (CAS) STRIKES.

64. ADJUST FIRE WITHOUT AN FDC - "BLACK MAGIC".

65. ADJUST FIRE FOR MOVING TARGETS.

66. SEND SPORT REPORTS OF INTELLIGENCE AND BATTERY/BATTALION FDC.

67. PERFORM CRATER AND FRAGMENT ANALYSIS.

68. CUE THE AN/MPQ-4A RADAR ON SUSPECTED SOURCES OF ENEMY INDIRECT FIRE.

69. USE NIGHT OBSERVATION DEVICES.

Analysis Form and then were asked to complete it in the presence of the interview team.[1] Additionally, the interviewees were asked to comment on what they felt was the profile of a good FO, what they thought of the new FIST concept, and what their reactions were to their FAOBC training.

Task Analysis Form - The FO Task Analysis structured interview form (Refer to Figure 3-1 for a sample page of the Task Analysis Form) included the following information:

a. Task - a specific goal directed activity of an FO described by an action verb and an object.

b. Assumed Prerequisite Skills/Training - an indication of whether or not,. for this task, prerequisite skills or training were assumed for each task in FAOBC training and the extent that each interviewee possessed those prerequisites. This item was included in the Task Analysis Form because the FAOBC instructors pointed out that there were a number of FO tasks in which prerequisite skills were assumed by the developers of the FAOBC Course of Instruction (COI) but many of the incoming students did not possess the required skills. If this were true, training for those tasks would be insufficient for those students. It was hoped that the inclusion of this item in the FO Task Analysis would serve as a verification of this observation.

c. Frequency of Performance during a Combat Exercise - an indication of how often the task is performed in combat, or, in peace-time, during a combat exercise. It was rated on a five point scale that ranged from "never performed" to "performed very often". For the present task analysis, the opportunity

[1] At Ft. Riley and Ft. Hood, interviews were conducted by MDAC-St. Louis personnel or ARI Ft. Sill personnel. At Fort Lewis, the Task Analysis Form completion was supervised by the Division Artillery staff with written instructions provided by MDAC-St. Louis.

TASKS	ASSUMED PREREQUISITE SKILLS/TRAINING	FREQUENCY OF PERFORMANCE DURING COMBAT EXERCISE					TIME BETWEEN JOB ENTRY AND FIRST TIME PERFORMED					TASK DIFFICULTY						TRAINING DIFFICULTY					CRITICALITY: CONSEQUENCES OF INADEQUATE PERFORMANCE					CRITICALITY: COMBAT ESSENTIAL					REMARKS
	YES/NO	NEVER	INFREQUENTLY	OCCASIONALLY	OFTEN	VERY OFTEN	NOT YET PERFORMED	MORE THAN TWO YEARS	BETWEEN ONE - TWO YEARS	BETWEEN 6 MOS - ONE YEAR	DURING FIRST SIX MONTHS		NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	
26. Determine target location by polar plot		( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	GENERAL	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
												EUROPEAN	( )	( )	( )	( )	( )																
												M. EAST	( )	( )	( )	( )	( )																
												FAR EAST	( )	( )	( )	( )	( )																
												AFRICA	( )	( )	( )	( )	( )																
27. Determine target location by grid coordinates.		( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	GENERAL	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
												EUROPEAN	( )	( )	( )	( )	( )																
												M. EAST	( )	( )	( )	( )	( )																
												FAR EAST	( )	( )	( )	( )	( )																
												AFRICA	( )	( )	( )	( )	( )																
28. Determine target location by shift from a known point using observer/target directions.		( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	GENERAL	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
												EUROPEAN	( )	( )	( )	( )	( )																
												M. EAST	( )	( )	( )	( )	( )																
												FAR EAST	( )	( )	( )	( )	( )																
												AFRICA	( )	( )	( )	( )	( )																
29 Determine target location by shift from a known point using a horizontal shift.		( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	GENERAL	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
												EUROPEAN	( )	( )	( )	( )	( )																
												M. EAST	( )	( )	( )	( )	( )																
												FAR EAST	( )	( )	( )	( )	( )																
												AFRICA	( )	( )	( )	( )	( )																
30 Determine target location by shift from a known point using a vertical shift.		( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	GENERAL	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
												EUROPEAN	( )	( )	( )	( )	( )																
												M. EAST	( )	( )	( )	( )	( )																
												FAR EAST	( )	( )	( )	( )	( )																
												AFRICA	( )	( )	( )	( )	( )																

Figure 3-1 SAMPLE PAGE FROM FORWARD OBSERVER TASK ANALYSIS FORM

to perform the task would vary by the number of combat exercises the interviewee had participated in since the identified FO tasks would only be performed in peacetime exercises. Thus, the frequency of occurrence during any combat exercise, not how often the individual had performed the task on the job, was of primary interest.

d. <u>Time between Job Entry and First Time Performed</u> - an indication of the length of time between completion of training and performance of the tasks on the job. It was rated using the following scale: (1) Task not yet performed; (2) Task first performed more than two years after FAOBC graduation; (3) Task first performed between one and two years after FAOBC graduation; (4) Task first performed between six months and one year; and (5) Task performed during first six months of assignment after FAOBC graduation.

e. <u>Task Difficulty</u> - A measure of the relative difficulty involved in performing the task. It was rated on a five point scale from "not difficult" to "extremely difficult" for five different combat scenarios. The first scenario was a general combat scenario which encompassed all possible combat situations. The second scenario included Europe, the third, Far East, the fourth, Middle East, and the fifth, Africa. The scenarios were distinguished along six dimensions: terrain type, ground cover, population density, probable opposition and threat level, air superiority, and map quality. Table 3-2 was given to the experienced FO's to be used as a guide in rating each task for difficulty of scenario. Additionally, each individual that completed the form was asked to draw upon his military experience to supplement the scenario definitions. Rating by scenario applied only to task difficulty and, for some tasks, criticality. All other rating categories assumed the general combat scenario.

TABLE 3-2

Combat Scenario Definitions

	Terrain Type	Ground Cover	Population and Manmade Landmarks	Probable Opposition/ Threat Level	Air Superiority	Quality & Recency of Maps & Suppporting Items
Europe	Flat to hilly to mountainous	Moderate to Heavy	Dense, with many manmade features	Massive	Questionable	Very good
Far East (e.g. Viet Nam)	Varied	Heavy jungle; rice paddies	Moderate, villages and small settlement	Limited guerrilla	U.S. dominance	Fairly good, some major gaps
Middle East	Hilly desert	Sparse	Sparse	Large diverse	Questionable	Reasonably good
Africa	Hilly to flat	Heavy, jungle or tall grass in large open spaces Desert	Sparse	Limited guerrilla	Probable U.S. dominance	Poor, may have to rely on photo-interpretation

f. Training Difficulty - a measure of the difficulty involved in learning how to perform the task. It was rated on a five-point scale from "not difficult" to "extremely difficult".

g. Criticality

1.) Consequences of inadequate performance - an indication of the seriousness of probable consequences of inadequate performance. It was rated on a five-point scale from "not serious" to "extremely serious".

2.) Combat essential - a measure of the extent to which the task is essential in combat. It was rated on a five-point scale from "not essential" to "extremely essential".

Three tasks, 18, 58, and 59 were rated on criticality for each of the five scenarios. In a developmental version of the FO Task Analysis Form, all tasks were rated on criticality for each combat scenario. However, after several Task Analysis Form administration practice sessions, it was determined that, for the majority of the tasks, the criticality ratings for all five scenarios would be the same. For Tasks 18, 58, and 59, the criticality ratings were thought to vary because of their differential mission probability of occurrence. As an example, it was pointed out that p'ctomaps (Task 18) were more likely to be used in Africa because the maps for Africa were out of date. The probable use of shell illumination (Task 58) and quick smoke (Task 59) was also thought to vary among the combat scenarios.

FO Task Analysis Results

Interviewee Population Description. Of the 56 officers who completed the Task Analysis Form, 31 were second lieutenants, 22 were first lieutenants, two were captains and one was a major. (The two captains and the major were no longer serving as FOs; however, they had had experience as FOs in the Viet Nam war.) Their present work assignments i .ded: 22 FIST Chiefs, 13 Fire Support Officers, 5 Fire Direction

Officers, 3 Assistant Executive Officers, 3 Forward Observers, 3 Executive Officers, 2 Ammo Officers, 2 Reconnaissance Survey Officers, 1 S-3 (Training and Operations Officer), 1 S-4 (Supply Officer), and 1 S-5 (Civilian and Government Liaison Officer). The average total number of months as an artillery officer was 23.52, the average total number of months as an FO was 7.44, and the mean number of combat exercises participated in by an individual during the last 18 months was 11.19. Thirty-four of the interviewees had completed FACBOC training after FAOBC and seven had received no other training. An additional 17 training courses were listed as having been completed after FAOBC and ranged from an airborne course (two individuals) to a Nuclear-Biological-Chemical course (five officers) to a course in basic highway and rail operations.

It is obvious from the above description that the officers who participated in the FO Task Analysis represented a wide range of experience and training and because of the small sample size, the validity of their responses may be open to questions. However, when a comparison was made between their responses and the responses of the officers who completed the FOQ for tasks that were included in both forms, it was apparent that the FO Task Analysis interviewees represented the general population of FOs. Further discussion of the tasks included on both forms is presented in a later section.

FO Task Analysis Summary Data. The responses to all categories of the FO Task Analysis Form were tallied and the percentages for each rating category were calculated. The summary data for each category for all tasks, with the exception of task difficulty and task criticality by scenario, are included in Appendix E. Summary data for the "Assumed Prerequisite Skill/Training" entry are not included in this table because after an evaluation of the inconsistent responses to this item, it was clear that many of the interviewees had misinterpreted the instructions. The officers who completed the Task Analysis Form were told to respond with two answers to tasks in which prerequisite skills or training were assumed. They were to respond with "yes/yes" if the

skills were assumed in their FAOBC training and they possessed them; or "yes/no" if the skills were assumed but they did not possess them. Instead, many responded with a "yes" which could be interpreted to mean yes, the skill was assumed but the interviewee did not have it, or yes, it was assumed and yes, he had it. Others responded with a "no" which was even more difficult to interpret. Since there seemed to be little relationship between the responses and FAOBC policy regardless of how the "yes" or "no" responses were interpreted, these data were neither analyzed nor included in the task summary tables.

Criticality Ratings by Combat Scenario. Frequencies and percentages of the consequences of inadequate performance and combat essential ratings for Tasks 18, 58 and 59 by the five combat scenarios were determined and the summary data are included in Table 1 and Table 2 in Appendix F. Except for slight fluctuations among the cell entries for each task and scenario, there seems to be little variation across the scenarios. Criticality, then, as determined by consequences of inadequate performance and combat essentiality, does not seem to be a function of combat scenario for these three tasks.

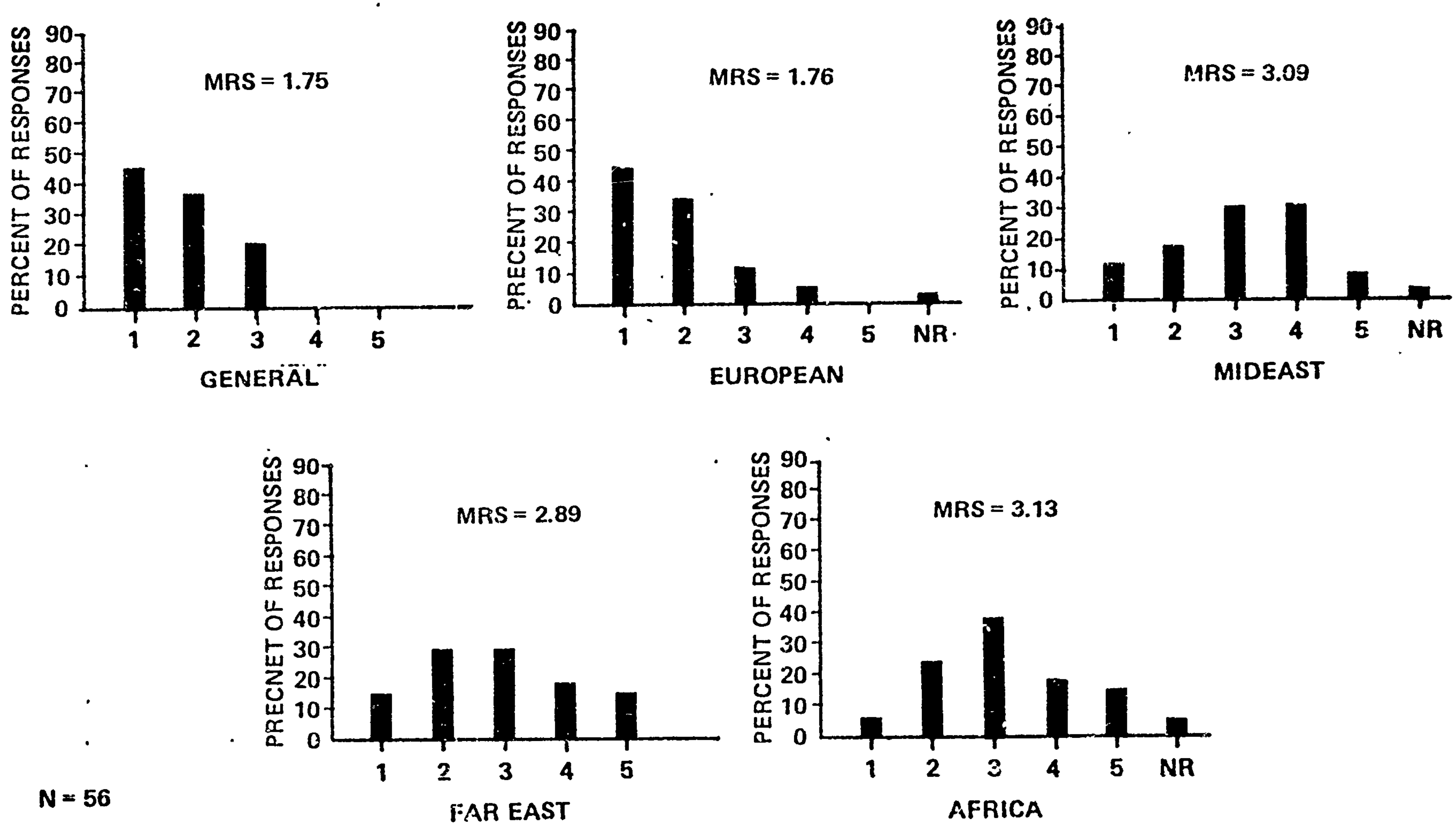
Task Difficulty by Combat Scenario. Similarly, the percentages of response to task difficulty ratings by combat scenario were calculated and summarized in Appendix G. In examining the task difficulty data it became apparent that those tasks which were most affected by terrain differences were the same tasks for which the most variability in task difficulty was found. Of the 69 tasks listed, 25 of them exhibited marked differences in task difficulty across the five combat scenarios. (In Table 3-1, the tasks are: 3, 4, 5, 7, 8, 9, 10, 12, 13, 14, 16, 18, 19, 20, 21, 22, 23, 24, 25, 27, 39, 40, 56, 59, and 62.) Most of the 25 tasks that exhibited difficulty by scenario differences involve visual/spatial integration abilities which are related to map reading, terrain association, and navigation skills.

The following is a brief discussion of nine of the tasks that demonstrated the most variability in task difficulty by scenario. Each task discussion is accompanied by a graphical representation of the task

difficulty ratings for each combat scenario. Task difficulty ratings from 1 (Not Difficult) to 5 (Extremely Difficult) and NR (No Response) are depicted along the abscissa and percentage of response is on the ordinate. Superimposed on each histogram is the mean task difficulty rating score that was calculated for each combat scenario.

a.) Task 4 - Conduct a terrain analysis. As ~~were~~ was expected, the task difficulty ratings on this task were highly affected by terrain differences and population density. (Refer to Figure 3-2). The African combat scenario, closely followed by the Middle Eastern scenario, was rated as being the most difficult to perform. The African combat scenario encompassed both heavy, jungle-type terrain and large open areas made up of deserts or flatland. The Middle East was represented as being a hilly desert-type terrain with a sparse ground cover. Both the African and the Middle Eastern scenarios were thought to have few population centers and manmade landmarks. Thus, the task of conducting a terrain analysis in either of these two scenarios when there is very little of any substance to aid in the analysis would be much more difficult than terrain analysis in a European combat theater with its varied terrain, dense and numerous population centers, and many manmade landmarks. The Far Eastern scenario, a varied landscape with a moderate number of landmarks and settlements, was rated as being much more difficult than the European scenario, possibly because of the inclusion of heavy jungle amidst the farmland settings. However, the Far Eastern combat scenario is not rated as difficult as the Middle Eastern or the African scenarios. It is interesting to note that the general combat scenario is rated as being almost identical in task difficulty to the European combat scenario. It is the general combat scenario which is taught in FAOBC, and, from our discussions with FAS instructors, the general scenario, in most cases, is the European scenario. The question then arises, are the Field Artillery officers who are assigned to a non-European combat theater adequately prepared to serve as effective FOs? This, and other similar questions are addressed in the training analysis section of this paper.

TASK: 4). CONDUCT A TERRAIN ANALYSIS



N = 56

MRS = MEAN RATING SCORE

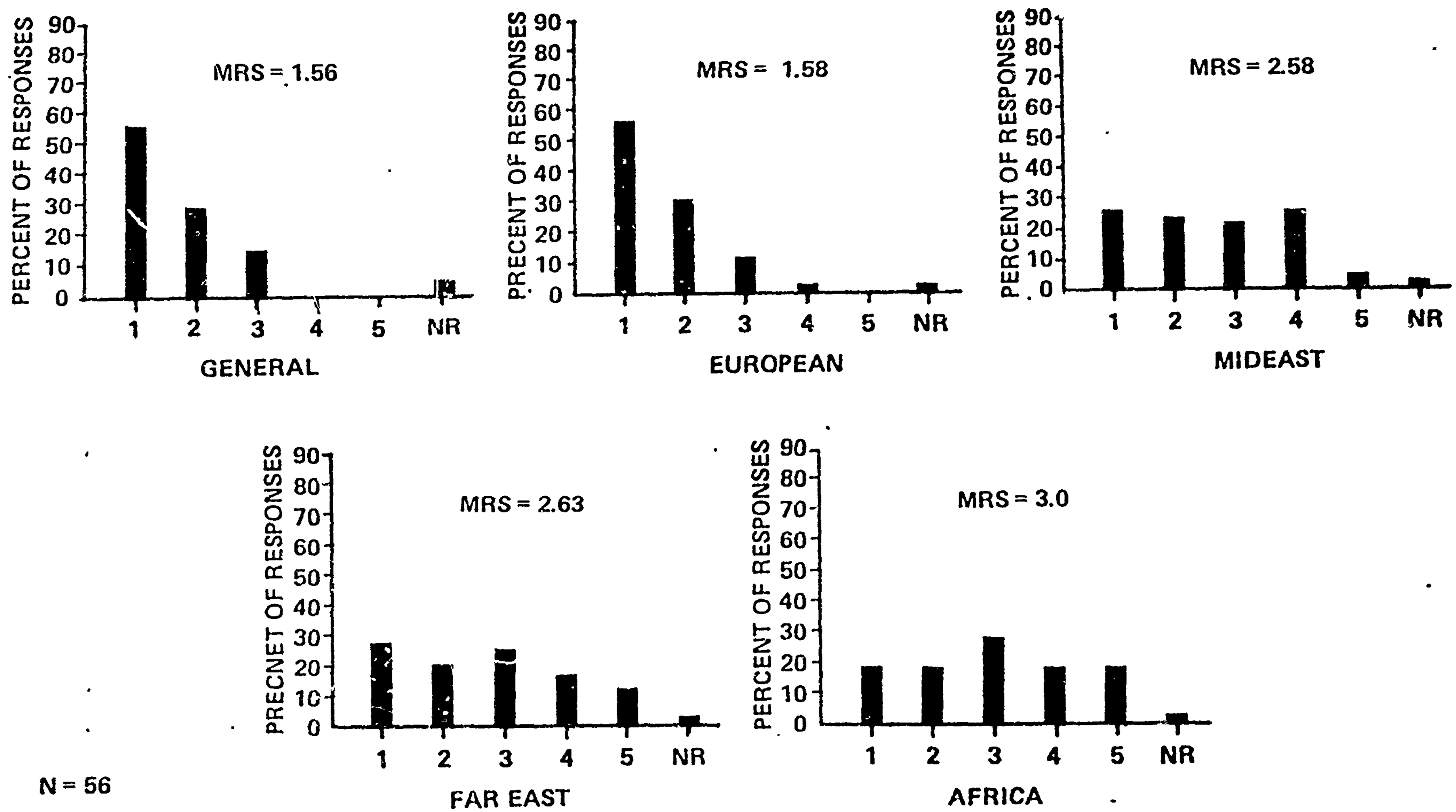
Figure 3-2 Task Difficulty by Scenario

b.) Task 5 - Read a military map. The quality and recency of the maps for each combat scenario was directly reflected in the task difficulty ratings. (Refer to Figure 3-3.) Africa, with the poorest quality maps, was thought to be the most difficult of the combat scenarios in which to read a military map. Both the Middle Eastern and the Far Eastern scenarios were rated as being moderately difficult on this task. The general combat scenario was again rated as being identical to the European scenario on task difficulty. Fifty-five percent of the interviewees indicated that reading a map in the European or general combat scenario was not difficult. Difficulty on this task may not rest in the ability of the FO to read a military map but in his assessment of the usefulness of the map itself for each scenario.

c.) Task 7 - Orient a map by terrain association. Varied terrain and map quality interacted to produce task ratings that divided the general and European combat scenarios from the Mid Eastern, Far Eastern, and African scenarios. (Refer to Figure 3-4.) Most of the individuals completing this form rated the general and European scenarios as being not difficult to slightly difficult to perform. However, the majority of ratings for the Mid Eastern, Far Eastern, and African scenarios ranged from moderately difficult to extremely difficult to perform. Thus poor maps, when combined with terrain which is difficult to interpret, can make this task very difficult to perform.

d.) Task 8 - Determine self-location by terrain association. One of the conclusions of the WSTEA-I study was that most experienced FOs have difficulty in self-location skills. Task difficulty ratings on this task tended to confirm the WSTEA-I results. (See Figure 3-5.) This task was one of few tasks in which the task difficulty rating for the general combat scenario was radically different from the European scenario as well as being rated as the most difficult of the five scenarios. For the general scenario, 68% felt that this task was an extremely difficult task to perform. However 74% rated this task as being not difficult to slightly difficult to perform in the European scenario. The African scenario was rated second on task difficulty, followed closely by the Mid Eastern and the Far Eastern scenarios

TASK: 5). READ A MILITARY MAP



N = 56

MRS = MEAN RATING SCORE

Figure 3-3 Task Difficulty by Scenario

TASK: 7). ORIENT A MAP BY TERRAIN ASSOCIATION

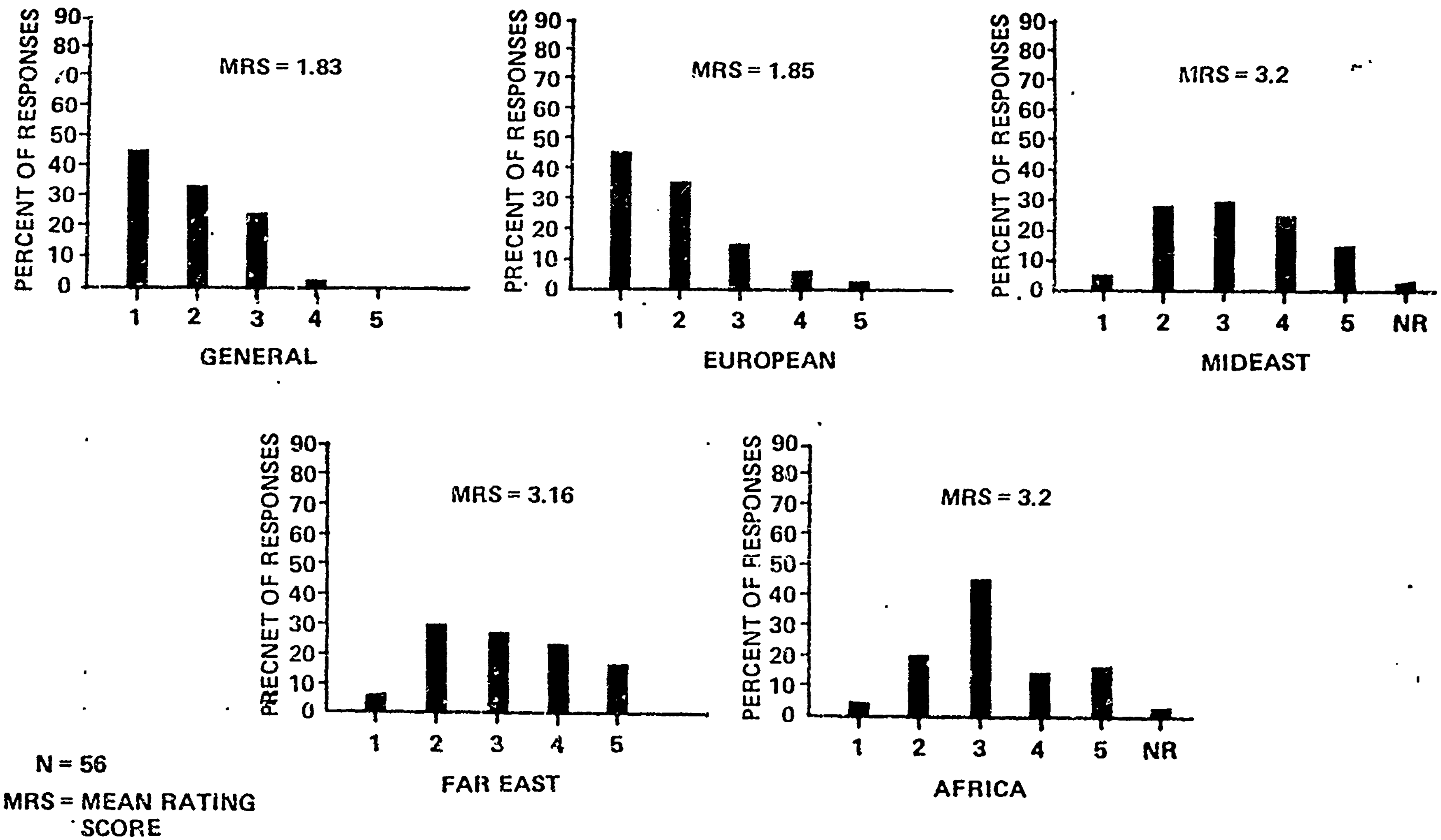
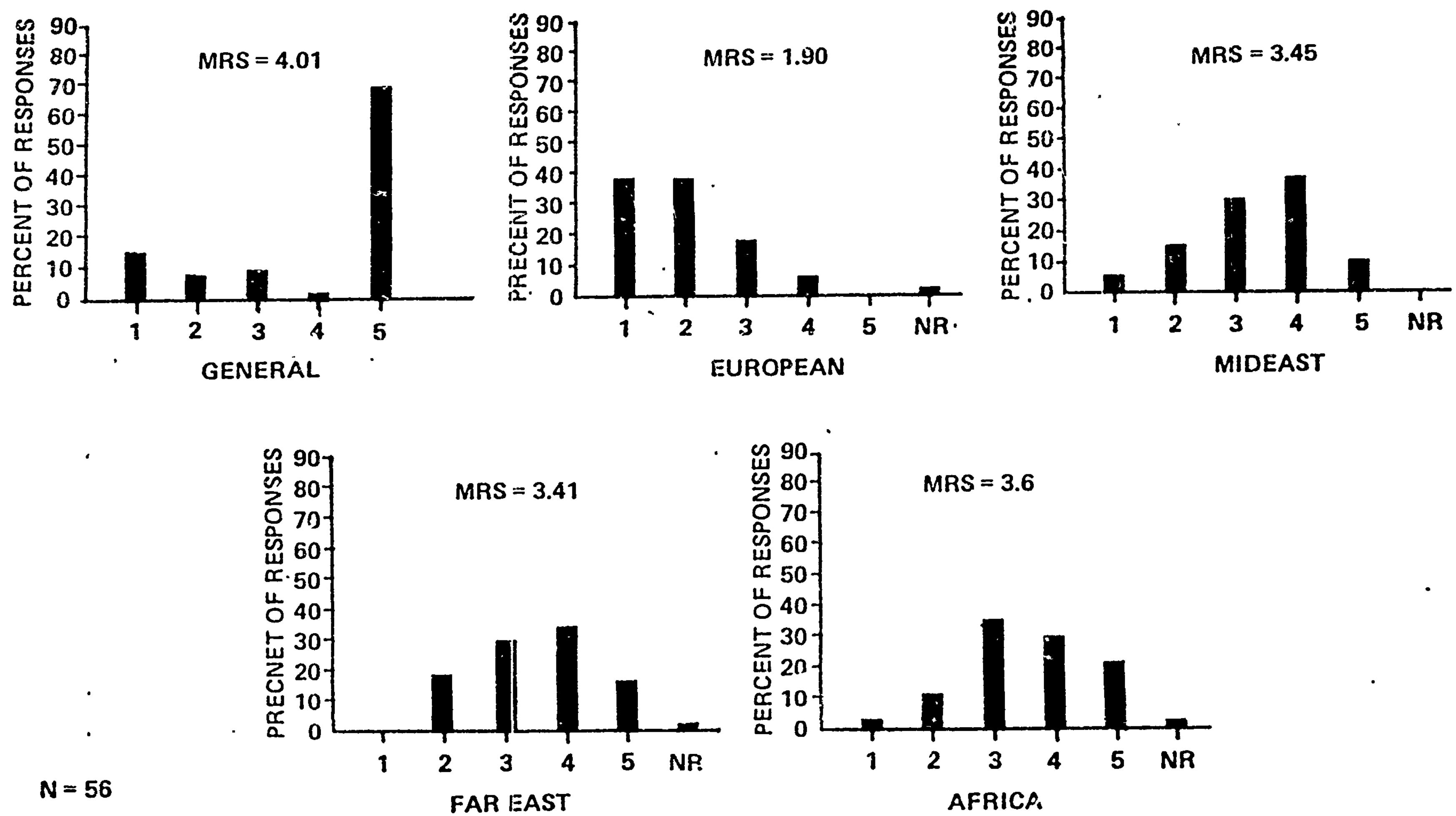


Figure 3-4 Task Difficulty by Scenario

TASK: 8). DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION



N = 56
MRS = MEAN RATING SCORE

Figure 3-5 Task Difficulty by Scenario

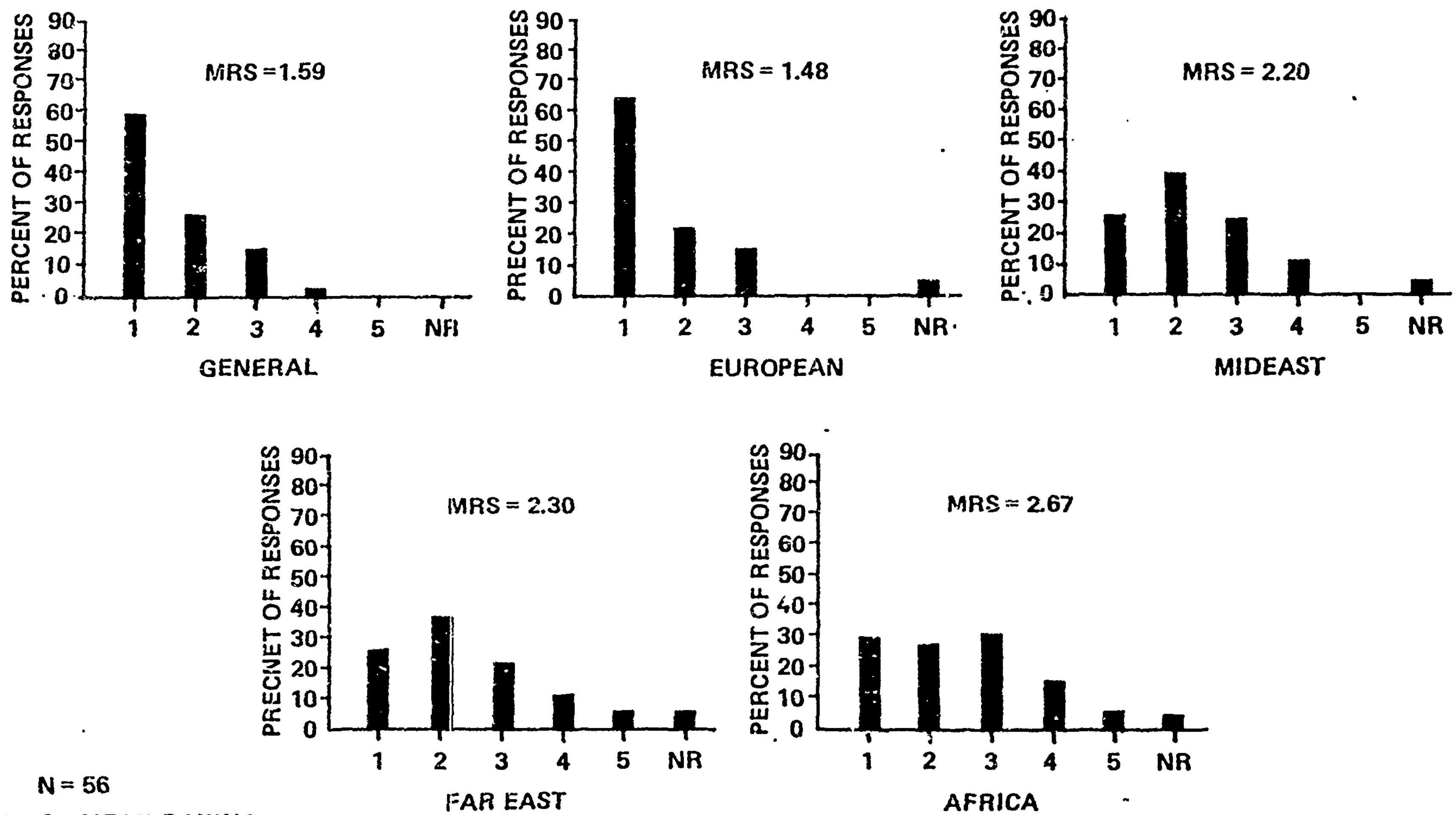
When asked to comment on these divergent task difficulty ratings, FAOBC instructors felt the task ratings provided a very good picture of how difficult it is to determine self-location by terrain association. The European scenario would be the easiest because of the large number of manmade structures, landmarks, and roads; and, because of the lack of the same, the African, Mid Eastern and Far Eastern scenarios would be much more difficult. In general, the instructors felt that self-location by terrain association is a very difficult task and many experienced FOs are likely to demonstrate problems on this particular task. The instructors added that the data on the general scenario difficulty rating were indicative of the way it really was and more training time should be devoted to this task because it can be so difficult.

e.) Task 13: Make a map reconnaissance. Quality, type and recency of the maps was obviously affecting task difficulty ratings for this task. (Refer to Figure 3-6.). The African scenario, with the poorest set of maps, was perceived as being the most difficult of the five scenarios. The Far Eastern and the Middle Eastern scenarios were rated as being slightly to moderately difficult. The general combat scenario was again rated as being very similar to the European scenario. The conclusion is that given good quality maps, making a map reconnaissance is a relatively easy task but given poorer quality maps, the difficulty level of the task increases.

f.) Task 19: Navigate on land by foot.

g.) Task 20: Navigate on land from a vehicle. Figures 3-7 and 3-8 depict the difficulty ratings for these two tasks. It is interesting to note that navigating from a vehicle was considered to be more difficult to perform than navigating on foot for each scenario. That is, for the general scenario, navigating from a vehicle was more difficult than navigating on foot. When navigating from a vehicle, there is a much greater opportunity for getting turned around or becoming disoriented, and the ratings clearly reflect this difference. The African and Far Eastern combat scenarios were considered to be the most difficult

TASK: 13). MAKE A MAP RECONNAISSANCE

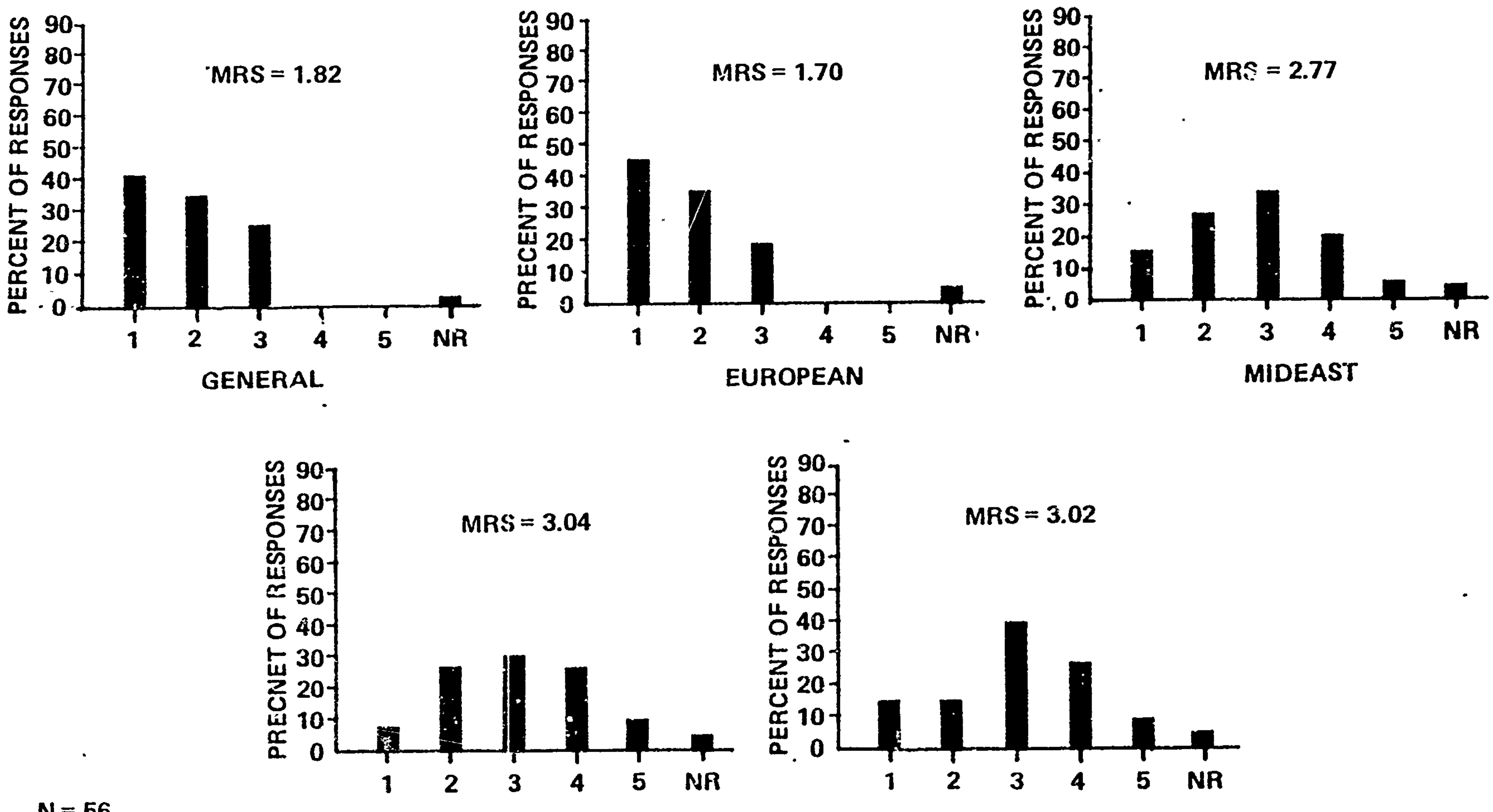


N = 56

MRS = MEAN RATING SCORE

Figure 3-6 Task Difficulty by Scenario

TASK: 19). NAVIGATE ON LAND BY FOOT



N = 56

MRS = MEAN RATING SCORE

Figure 3-7 Task Difficulty by Scenario

TASK: 20). NAVIGATE ON LAND FROM A VEHICLE

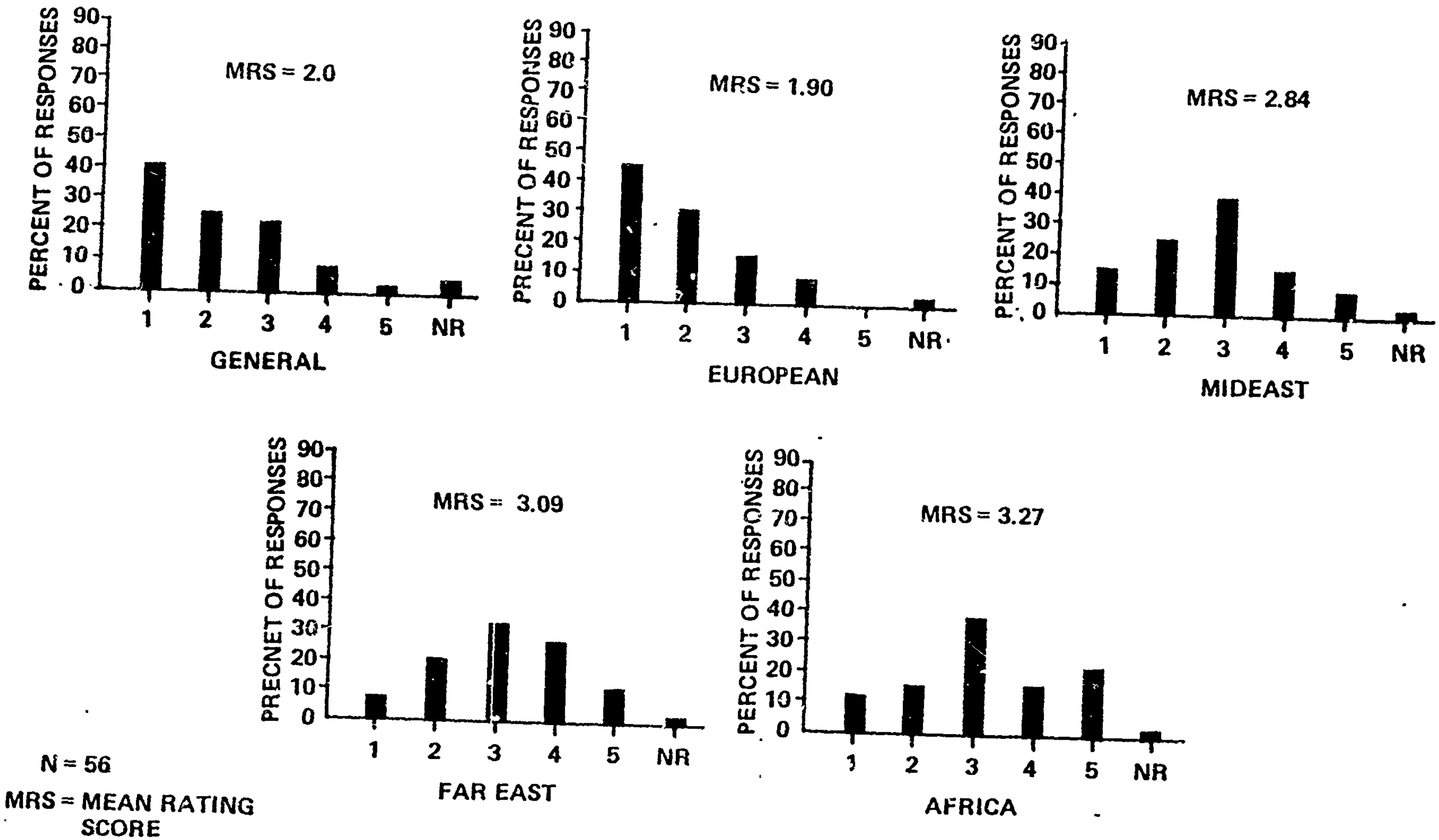


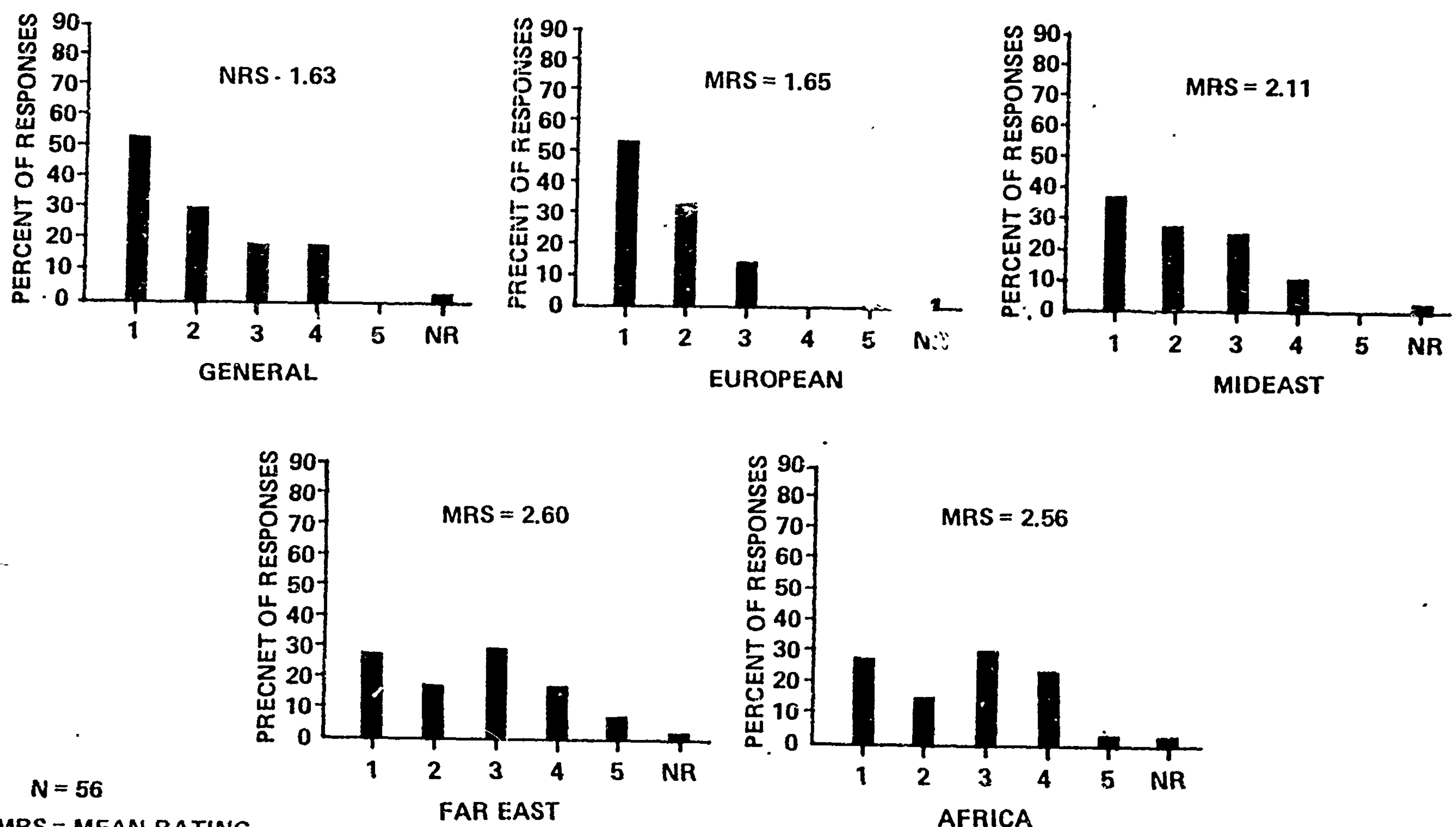
Figure 3-8 Task Difficulty by Scenario

for both tasks. This was not surprising since both have remarkably varied terrain including thick, dense jungles. Rolling, shifting desert and a scarcity of landmarks lead to moderate ratings of difficulty for the Mid Eastern combat scenario. The European and general combat scenarios were rated as the easiest of the combat scenarios on the land navigation task. Thus, land navigation is a relatively easy task in an area where there are roads, many landmarks (natural and manmade), and population centers.

h.) Task 24: Acquire targets. As can be seen in Figure 3-9, the type and variety of terrain seem to most heavily influence the difficulty of acquiring targets in each of the combat scenarios. The more varied the terrain, the more difficult the task. Because of the dense jungles found in Africa and the Far East, acquiring targets was rated as being more difficult than in the other combat scenarios. In the Mid East, acquiring targets was rated as being not difficult to slightly difficult by 63% of the interviewees; and for the general and European scenarios, 52% rated the tasks as being not difficult. Clearly then, having a clear line of sight to the target affects the difficulty of performing the task.

i.) Task 39: Determine distance by estimation. The same terrain problems that affect acquiring targets also influence the ability to estimate distance as demonstrated in Figure 3-10. Africa and the Far East are essentially identical in task difficulty rating with more than 60% of the interviewees indicating that the task was moderately to very difficult to perform. Approximately 55% of the interviewees rated distance estimation as being moderately to very difficult for the Mid Eastern combat scenario. The effects of desert terrain such as glare, clear air, and lack of relevant salient features appear to contribute to the high difficulty ratings on distance estimation for the Mid Eastern scenario. Conversely, over 70% of the respondents rated the general and European scenarios as ones for which distance estimation is not difficult to slightly difficult to perform. Distance estimation may have been

TASK: 24). ACQUIRE TARGET (S)

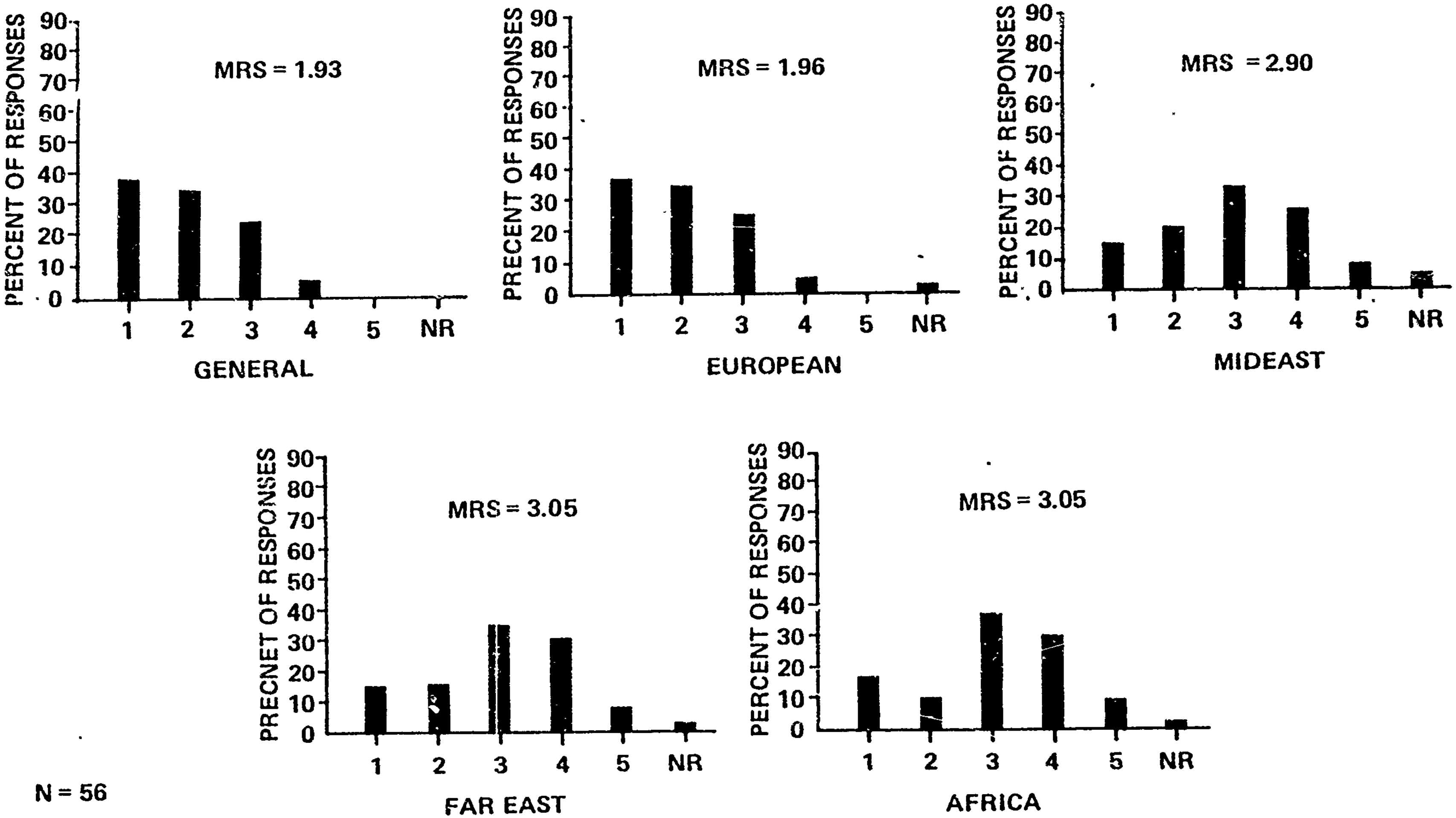


N = 56

MRS = MEAN RATING SCORE

Figure 3-9 Task Difficulty by Scenario

TASK: 39). DETERMINE DISTANCE BY ESTIMATION



N = 56

MRS = MEAN RATING SCORE

Figure 3-10 Task Difficulty by Scenario

perceived as being easier to perform in European terrain since that terrain is much more familiar to most FOs than a jungle or desert environment.

In reviewing these task scenario and difficulty rating differences, it became apparent that the type of terrain and quality and recency of the maps can severely attenuate the ability of the FO in performing his job. Terrain variance and map quality can add a different level of complexity to tasks that on their own may be fairly simple to perform. With more than half of the selected tasks demonstrating differences in task difficulty ratings for each scenario an important question was raised. How equipped to handle these differences is the FO who graduates from FAOBC with training for only the general combat scenario? The answer might be, he is well equipped to at least deal with the determination of self-location by terrain association since for this task the general scenario was the most difficult. However little emphasis or training time is given to this task because it is assumed that the student in FAOBC has this skill prior to his training at Ft. Sill. Both the FAOBC students and the instructors confirm that this is an incorrect assumption.

Instructors, when queried concerning scenario difference stated that on occasion these differences may be pointed out to the student FO by some of the instructors, some of the time. However, there was no time allocated for the training in development of the techniques in how to perform these tasks for the various combat scenarios. Examination of the COI for FAOBC verified this latter statement.

Two important points must be considered here. One pertains to discrepancies in the required and actual preparation of FAOBC students prior to FAOBC. It is clear that many of the students enter FAOBC with inadequate training in the areas of map reading and terrain association. The second point pertains to the need to consider scenario differences in developing training programs. It is very likely that there will be positive transfer from training for one scenario to application in another scenario; however, the extent of transfer will probably depend

on the nature and extent of scenario differences and on the complexity of the specific task. The dramatic differences in task difficulty by scenario which were revealed in the task analysis section make clear the importance of scenario effects.[1] Further discussion of the implications of task difficulty ratings by scenarios is presented in the Training Analysis section.

Task Selection

Task Selection Algorithm. In order to identify those tasks that should be included in an FO training program, a task selection algorithm was developed that differentially weighted performance, frequency, difficulty, and criticality ratings. A task flow diagram of the FO Task Selection Algorithm is included in Figure 3-11.

To enter the equation, the task analyst asked "Was the task performed during the first six months?" It was felt that if the task was not performed during the first six months on the job, the likelihood of the FO forgetting how to perform the task would be increased. Because the amount of time allocated to FO training is limited, the available time would best be spent training those tasks that are most likely to be reinforced by usage during the first six months. Those tasks, then, that were not performed during the first six months on the job by the majority of the interviewed FOs were deleted from the list of FO training tasks. However, the algorithm was constructed so that for any given task instructors were permitted to override the task rejection and recommend its inclusion in the FO training tasks list. As pointed out in an earlier section, the task analysis summary data and preliminary selection matrix were discussed with FAOBC instructors and their opinions, conclusions, and recommendations were considered. In the category "Performance During the First Six Months", none of the tasks that were rejected for failure to meet this critierion were overridden by the instructors.

[1]We are not arguing for additional training time. In the allocating of resources within the limited training time available, scenario effects should be considered.

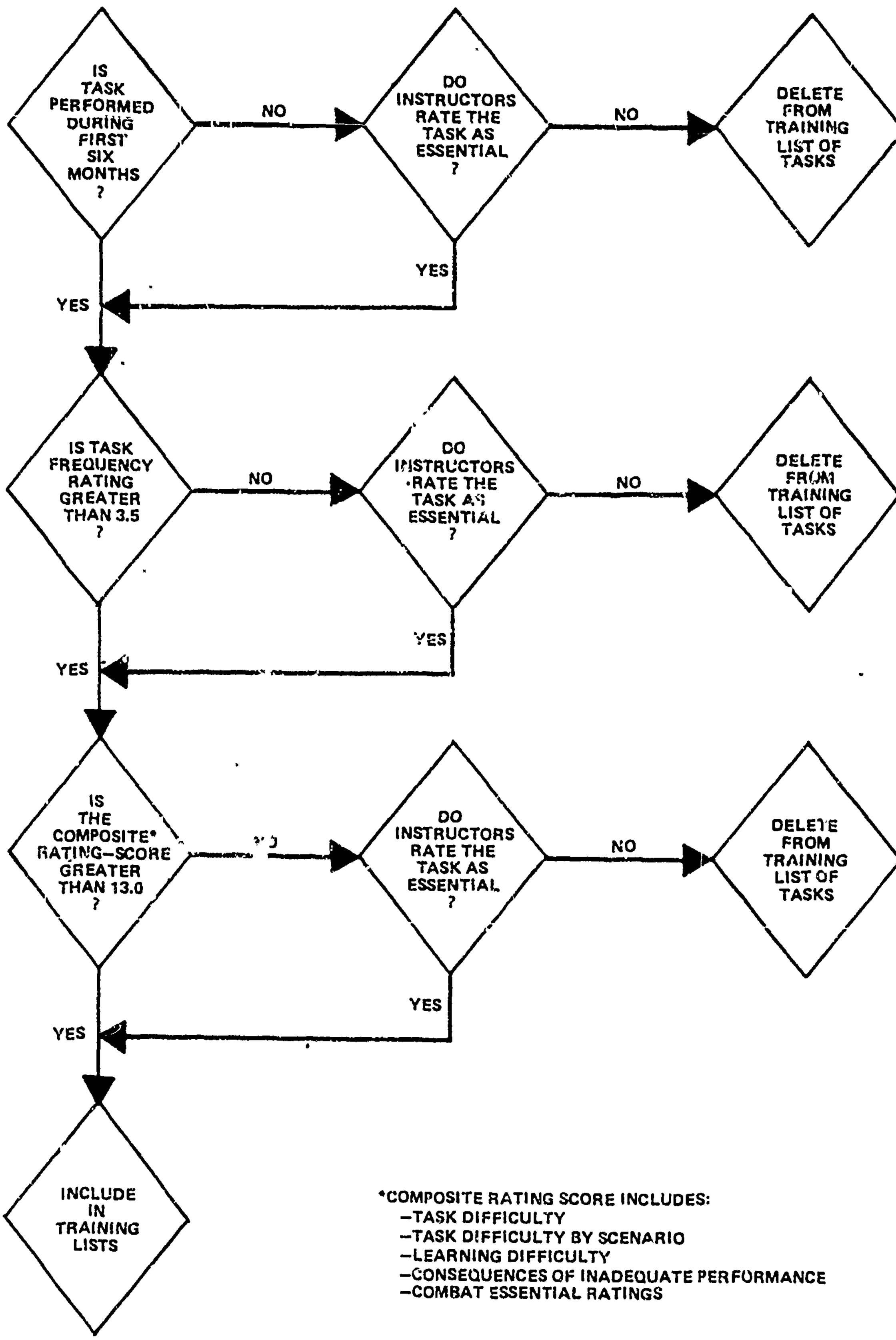


FIGURE 3–11 FO TASK SELECTION ALGORITHM

The second question that was asked in the task selection algorithm concerned the frequency of performance during a combat exercise (see Figure 3-11). In order to be considered for inclusion in the training list of tasks, the mean rating score had to have been equal to or greater than 3.5. The mean rating score number of 3.5 was the result of a carefully considered but ultimately arbitrary decision. The value, 3.5, is halfway between "often" and "very often" on the task frequency scale. If additional time constraints were placed on the FO training program, this arbitrary cut-off point may be increased, thereby reducing the number of tasks to be considered for training. Again, instructors were permitted to override the task rejection conclusion. Those tasks that were subject to the instructors override are discussed in a later section.

The third and final hurdle that a task had to pass in order to be included in a list of FO training tasks involved meeting or exceeding a composite criterion score of 13.0. (See Figure 3-11.) The composite score consisted of the total of the mean rating scores for task difficulty (general combat scenario), task difficulty by scenario (the average rating score of the European, Mid Eastern, Far Eastern and African combat scenarios), training difficulty, consequences of inadequate performance, and combat essentiality. Each rating category was assigned a minimum rating scale value. For task difficulty, task difficulty by scenario, and training difficulty the minimum entry rating scale value was 2.0 which translates to slightly difficult. When the response pattern of the task analysis interviewees were compared with the task difficulty ratings of the 332 experienced FOs on items common to both the Task Analysis Form and the Forward Observer Questionnaire, it was discovered that the task analysis interviewees tended to respond with consistently much lower task difficulty ratings.[1] Tasks that were rated as being moderately difficult in the FOQ were rated as slightly difficult on the Task Analysis Form. Apparently, the broader experience base of the more senior officers who completed the FOQ may

[1] Summary data from the task rating portion of the FOQ is presented in Appendix H.

have given them a different perspective when compared with the 56 FOs who completed the Task Analysis Form. Credence was lent to this hypothesis since a relationship was noted between amount of experience and difficulty ratings as demonstrated in Table 2 of Appendix H. The more experience the Field Artillery officer had, the more likely he would rate a task as being more difficult. The majority of the individuals who participated in the Task Analysis interview were young, relatively inexperienced lieutenants who may not have had as thorough an understanding of combined arms operations as the more senior officers. It was felt, then, that tasks which were rated as slightly difficult by the task analysis interviewees may, in fact, be moderately difficult for the FO trainee. Thus, it was determined that tasks rated as slightly difficult on these three difficulty dimensions should be considered for inclusion in FO training.

The minimum average rating scores for the two criticality measures was 3.5- - moderately to very serious consequences of inadequate performance or moderately to very combat essential. The decision to use 3.5 as the minimum mean scale value for these two indicators of criticality was again an arbitrary one that was based on the assumption that a task must be more than moderately critical to be included in a training program. If the training time were compressed, the minimum cut-off rating scores for criticality and difficulty could be increased which would decrease the number of tasks necessary for training. In effect, this task selection algorithm can expand or contract to accomodate varying training logistics requirements. What has been presented here is a task selection scheme that attempted to optimize the use of objective criteria in the task selection process.

The total of these five mean rating score values, then, is the composite score. Summing the mean rating values in this way permitted the inclusion of tasks that may have received low difficulty ratings but very high criticality scores with the reverse true as well. Tasks that were rated as being low on both dimensions were then identified for

removal from the FO training tasks list. Provisions were made, however, for instructor override on any task that was rejected as a result of the task selection process.

Task Selection Results

In Table 3-3 the results of the task selection process are presented. The answer to the question concerning task performance is in the first data column. The response "yes" or "no" is based on the majority of responses to this question. Column two contains the mean score values for the performance frequency rating. (Note: the mean score value is the mean derived from ratings on a five-point scale.) Column three is the mean score value for task difficulty; column four, the mean rating score for task difficulty by combat scenario; column five, the mean rating score for training difficulty; column six, the mean rating score for consequences of inadequate performance; and, column seven, the mean rating value for combat essentiality. An asterisk has been placed behind the mean rating scale value in column four to indicate those tasks that demonstrated marked differences in task difficulty for the five combat scenarios. Column eight is the composite score and column nine the task selection decision that was the product of the algorithm. Instructor override of the task rejection is presented in column ten.

Of the 69 tasks that were included in the FO Task List, 44 were rejected as a result of failure to meet the criteria of the algorithm and 17 were reinstated by instructor override. The final FO training list included 42 tasks. Eighteen of the rejected tasks were eliminated from the FO task list because they were not performed during the first six months on the job. Fourteen tasks were deleted from the task list because they were not performed as frequently as required in the task algorithm, although eight of these tasks were reinstated by instructor override. Twelve tasks failed to meet the composite score criterion; the instructors recommended that nine of these tasks be included in the FO training task list.

TABLE 3-3 FORWARD OBSERVER TASK SELECTION SUMMARY

		PERFORMANCE DURING FIRST 6 MOS.	PERFORMANCE FREQUENCY	TASK DIFFICULTY[1]	TASK DIFFICULTY BY SCENARIO[1]	TRAINING DIFFICULTY[1]	CONSEQUENCES OF INADEQUATE PERFORMANCE[1]	COMBAT ESSENTIAL[1]	COMPOSITE SCORE	ALGORITHM OUTCOME	INSTRUCTOR OVERRIDE
1.	DECLINATE AN M2 COMPASS	YES	2.25	1.17	1.42	1.21	2.82	3.13	10.25	REJECT	YES**
2.	DETERMINE DIRECTION USING AN M2 COMPASS.	YES	4.11	1.21	1.32	1.25	3.96	4.17	11.91	REJECT	YES**
3.	DETERMINE DIRECTION USING BINOCULARS AND KNOWN REFERENCES.	YES	3.77	1.47	2.11*	1.17	3.37	3.63	11.75	REJECT	YES**
4.	CONDUCT A TERRAIN ANALYSIS.	YES	4.43	1.75	2.72*	2.48	3.71	4.33	14.99	INCLUDE	
5.	READ A MILITARY MAP.	YES	4.86	1.56	2.45*	2.27	4.69	4.76	15.75	INCLUDE	
6.	ORIENT A MAP USING A COMPASS.	YES	3.64	1.19	1.42	1.34	3.55	3.50	11.00	REJECT	
7.	ORIENT A MAP BY TERRAIN ASSOCIATION.	YES	4.43	1.83	2.85*	2.20	3.76	3.96	14.60	INCLUDE	
8.	DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION.	YES	4.52	4.01	3.09*	1.98	4.16	4.29	14.53	INCLUDE	
9.	LOCATE AN UNKNOWN POINT ON A MAP BY RESECTION.	YES	2.68	1.61	2.40*	1.91	2.50	3.16	11.58	REJECT	
10.	LOCATE POINTS USING A SURVEY.	NO	2.09	2.09	2.61*	2.53	2.30	3.02	12.55	REJECT	
11.	MEASURE GROUND DISTANCES ON A MAP.	YES	4.02	1.19	1.57	1.38	3.18	3.56	10.88	REJECT	
12.	LOCATE AN UNKNOWN POINT ON A MAP BY INTERSECTION.	NO	2.52	1.47	2.03*	1.71	2.89	3.09	11.19	REJECT	
13.	MAKE A MAP RECONNAISANCE.	YES	4.20	1.39	2.16*	1.98	3.64	3.95	13.32	INCLUDE	
14.	PREPARE AND USE A TERRAIN SKETCH.	YES	3.68	1.46	1.94*	1.77	2.86	3.13	11.16	REJECT	YES**
15.	USE AN FDC PREPARED VISIBILITY DIAGRAM.	NO	1.61	1.82	1.99	2.08	2.43	2.40	10.72	REJECT	
16.	CONSTRUCT A VISIBILITY DIAGRAM.	YES	2.46	1.98	2.48*	2.20	2.39	2.69	11.74	REJECT	
17.	PREPARE AND USE AN OBSERVED FIRE FAN.	YES	3.86	1.25	1.45	1.45	3.49	3.46	11.1	REJECT	YES**
18. †	USE PHOTOGRAPHS, PHOTO MAPS OR PICTOMAPS AS A MAP SUBSTITUTE OR SUPPLEMENT.	NO	1.91	2.08	2.50*	2.49	2.9	3.20	13.17	REJECT	
19. †	NAVIGATE ON LAND BY FOOT.	YES	3.27	1.82	2.63*	2.48	2.58	4.31	13.82	INCLUDE	
20. †	NAVIGATE ON LAND FROM A VEHICLE.	YES	4.24	2.00	2.78*	2.73	4.11	4.40	16.02	INCLUDE	
21. †	NAVIGATE ON LAND WITHOUT ANY AIDS SUCH AS A MAP OR COMPASS.	NO	1.82	3.13	3.83*	3.57	3.72	3.66	17.91	REJECT	

1 - AVERAGE RATING SCORE.
† CURRENTLY NOT INCLUDED IN FAOBC.
*NOTE: SALIENT SCENARIO DIFFERENCES.
**SEE TEXT FOR EXPLANATION.

TABLE 3-3 FORWARD OBSERVER TASK SELECTION SUMMARY

		PERFORMANCE DURING FIRST 6 MOS.	PERFORMANCE FREQUENCY	TASK DIFFICULTY[1]	TASK DIFFICULTY BY SCENARIO[1]	TRAINING DIFFICULTY[1]	CONSEQUENCES OF INADEQUATE PERFORMANCE[1]	COMBAT ESSENTIAL[1]	COMPOSITE SCORE	ALGORITHM OUTCOME	INSTRUCTOR OVERRIDE
22.	SELECT AND OCCUPY OBSERVATION POSTS.	YES	3.93	1.57	2.13*	3.17	3.74	3.76	14.37	INCLUDE	
23.	OBSERVE FROM A TANK-MOUNTED POSITION.	NO	2.02	1.64	2.40*	2.19	2.77	3.66	12.66	REJECT	
24.	ACQUIRE TARGET(S).	YES	4.53	1.63	2.23*	2.29	4.52	4.61	15.28	INCLUDE	
25.	RECOGNIZE/IDENTIFY TARGET(S).	YES	4.08	1.94	2.34*	2.58	4.55	4.71	16.12	INCLUDE	
26.	DETERMINE TARGET LOCATION BY POLAR PLOT.	YES	3.02	1.51	1.81	1.78	3.39	3.60	12.09	REJECT	YES**
27.	DETERMINE TARGET LOCATION BY GRID COORDINATES.	YES	4.64	1.68	2.38*	2.05	4.35	4.76	15.22	INCLUDE	
28.	DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING OBSERVER/TARGET DIRECTIONS.	YES	3.40	1.68	1.98	2.15	3.73	4.05	13.59	REJECT	YES**
29.	DETERMINE TARGET LOCATIONS BY SHIFT FROM A KNOWN POINT USING A HORIZONTAL SHIFT.	YES	3.29	1.77	1.94	2.07	3.74	4.06	13.56	REJECT	YES**
30.	DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A VERTICAL SHIFT.	YES	2.84	1.90	2.14	2.24	3.41	3.57	14.53	REJECT	
31.	DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A LATERAL SHIFT.	YES	3.25	1.67	1.93	1.96	2.98	3.89	12.43	REJECT	YES**
32.	MEASURE AN ANGLE USING THE HAND AND FINGERS.	YES	3.04	1.30	1.34	1.57	2.89	3.05	10.15	REJECT	
33.	MEASURE AN ANGLE USING BINOCULARS.	YES	4.18	1.30	1.33	1.58	3.70	4.11	12.02	INCLUDE	
34.	MEASURE AN ANGLE USING AN AIMING CIRCLE.	NO	2.32	1.35	1.42	2.19	3.04	2.81	10.81	REJECT	
35.†	MEASURE AN ANGLE USING BATTERY COMMANDER'S PERISCOPE.	NO	1.95	1.43	1.52	2.00	2.78	2.30	10.03	REJECT	
36.	USE DEGREES AS ANGULAR MEASUREMENTS.	NO	2.11	1.25	1.32	1.49	3.00	3.02	11.33	REJECT	
37.	USE MILS AS ANGULAR MEASUREMENTS.	YES	4.68	1.22	1.25	1.45	4.11	4.36	12.39	REJECT	YES**
38.	DETERMINE DISTANCE BY FLASH-BANG METHOD.	YES	2.59	1.56	1.80	1.86	2.63	2.06	10.71	REJECT	

1 - AVERAGE RATING SCORE.
† CURRENTLY NOT INCLUDED IN FAOBC.
*NOTE: SALIENT SCENARIO DIFFERENCES.
**SEE TEXT FOR EXPLANATION.

TABLE 3-3 FORWARD OBSERVER TASK SELECTION SUMMARY

		PERFORMANCE DURING FIRST 6 MOS.	PERFORMANCE FREQUENCY	TASK DIFFICULTY[1]	TASK DIFFICULTY BY SCENARIO[1]	TRAINING DIFFICULTY[1]	CONSEQUENCES OF INADEQUATE PERFORMANCE[1]	COMBAT ESSENTIAL[1]	COMPOSITE SCORE	ALGORITHM OUTCOME	INSTRUCTOR OVERRIDE
39.	DETERMINE DISTANCE BY ESTIMATION.	YES	4.19	1.93	2.74*	2.64	3.77	4.00	15.08	INCLUDE	
40.	DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS.	YES	3.30	1.90	2.46*	2.68	3.31	3.46	15.82	REJECT	YES**
41.	DETERMINE AND USE GUN-TARGET LINE AS A SPOTTING LINE.	NO	2.48	2.06	2.27	2.24	3.49	3.44	13.52	REJECT	
42.	DETERMINE AND USE OBSERVER/TARGET LINE AS A SPOTTING LINE.	YES	4.30	1.4	1.60	1.68	4.04	4.31	13.05	INCLUDE	
43.	DETERMINE AND USE CARDINAL DIRECTION AS A SPOTTING LINE.	YES	2.43	1.57	1.79	1.91	3.30	3.43	12.00	REJECT	
44.	CHECK COMMUNICATIONS SYSTEMS.	YES	4.53	1.61	1.68	2.02	4.41	4.70	14.42	INCLUDE	
45.	REPORT POSITIONS TO FDC.	YES	4.14	1.51	1.85	1.84	3.95	4.07	13.22	INCLUDE	
46.	OPERATE OBSERVER'S RADIO AND WIRE EQUIPMENT IN FIRE DIRECTION CHANNELS OF THE FA BATTERIES.	YES	4.60	1.60	1.61	1.86	4.46	4.66	14.19	INCLUDE	
47.	USE THE CEOI TO DETERMINE CALL SIGNS, FREQUENCIES, NUMERAL CODE, AUTHENTICATION, AND ENCODING FOR THE GUIDED TEMPLATE.	YES	4.73	1.47	1.44	1.98	4.73	4.75	14.37	INCLUDE	
48.	USE PROPER RADIO-TELEPHONE PROCEDURES.	YES	4.64	1.31	1.33	1.86	3.86	4.04	12.40	REJECT	YES**
49.	PREPARE AND TRANSMIT A CALL FOR FIRE.	YES	4.58	1.35	1.37	1.98	4.29	4.54	13.53	INCLUDE	
50.	SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGET (FOR CANNONS).	YES	4.30	1.46	1.44	1.86	3.68	4.09	12.53	REJECT	YES**
51.	SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGETS (FOR MORTARS).	YES	3.23	1.45	1.41	1.72	3.41	3.85	11.84	REJECT	YES**
52.	REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING SUCCESSIVE BRACKETING PROCEDURES.	YES	3.54	1.50	1.61	1.91	3.63	3.89	12.54	REJECT	

1 - AVERAGE RATING SCORE.
† CURRENTLY NOT INCLUDED IN FAOBC.
*NOTE: SALIENT SCENARIO DIFFERENCES.
**SEE TEXT FOR EXPLANATION.

TABLE 3-3 FORWARD OBSERVER TASK SELECTION SUMMARY

		PERFORMANCE DURING FIRST 6 MOS.	PERFORMANCE FREQUENCY	TASK DIFFICULTY[1]	TASK DIFFICULTY BY SCENARIO[1]	TRAINING DIFFICULTY[1]	CONSEQUENCES OF INADEQUATE PERFORMANCE[1]	COMBAT ESSENTIAL[1]	COMPOSITE SCORE	ALGORITHM OUTCOME	INSTRUCTOR OVERRIDE
53.	REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING HASTY BRACKETING PROCEDURES.	YES	3.96	1.65	1.72	2.14	3.89	4.18	13.58	INCLUDE	
54.	REQUEST AND ADJUST FIRE USING CREEPING PROCEDURES.	YES	2.57	1.48	1.47	1.82	3.48	3.59	11.84	REJECT	YES**
55.	CONDUCT A PRECISION REGISTRATION.	YES	3.93	1.94	2.09	2.54	4.04	3.93	15.64	INCLUDE	
56.	CONDUCT A FIRE MISSION AS AN AERIAL OBSERVER.	NO	2.25	2.35	2.87*	2.96	3.69	3.89	15.76	REJECT	
57.	CONDUCT A SUPPRESSIVE FIRE MISSION ON A TARGET OF OPPORTUNITY.	YES	4.05	1.68	1.98	2.13	4.22	4.64	14.65	INCLUDE	
58.	CONDUCT A FIRE MISSION USING SHELL ILLUMINATION.	YES	3.79	1.84	2.06	2.59	3.96	4.00	14.45	INCLUDE	
59.	REQUEST AND ADJUST A QUICK SMOKE MISSION.	YES	3.50	1.69	2.12*	2.36	3.93	4.36	14.46	INCLUDE	
60.	CONDUCT AN IMMEDIATE SMOKE MISSION.	YES	3.61	1.73	1.96	2.16	3.87	4.32	14.04	INCLUDE	
61.	REPORT CONSEQUENCES OF FIRE-FOR-EFFECT ON TARGET.	YES	4.32	1.40	1.57	1.60	3.13	3.60	10.30	REJECT	YES**
62. †	REQUEST AND ADJUST NAVAL GUN FIRE.	NO	1.07	3.37	2.92*	2.88	3.50	4.13	16.80	REJECT	
63. †	REQUEST IMMEDIATE OR PRE-PLANNED CLOSE AIR SUPPORT (CAS) STRIKES.	NO	1.87	3.00	2.83	2.83	4.19	4.40	17.25	REJECT	
64. †	ADJUST FIRE WITHOUT AN FDC - "BLACK MAGIC"	NO	1.32	3.20	3.26	3.53	3.48	3.23	16.70	REJECT	
65. †	ADJUST FIRE FOR MOVING TARGETS.	NO	1.96	2.51	2.67	3.02	3.93	4.26	16.39	REJECT	
66.	SEND SPOT REPORTS OF INTELLIGENCE TO BATTERY/BATTALION FDC.	YES	3.60	1.65	1.47	1.64	3.96	4.31	12.85	REJECT	YES**
67.	PERFORM CRATER AND FRAGMENT ANALYSIS.	NO	2.14	1.88	2.06	2.28	2.98	3.71	10.63	REJECT	
68. †	CUE THE AN/MPQ-4A RADAR ON SUSPECTED SOURCES OF ENEMY INDIRECT FIRE.	NO	1.36	1.68	2.13	2.46	3.24	3.40	12.91	REJECT	
69. †	USE NIGHT OBSERVATION DEVICES.	NO	2.39	1.49	1.61	1.82	3.47	4.00	12.39	REJECT	

1 - AVERAGE RATING SCORE.
† CURRENTLY NOT INCLUDED IN FAOBC.
*NOTE: SALIENT SCENARIO DIFFERENCES.
**SEE TEXT FOR EXPLANATION.

The following is a brief discussion of the rationale used by the instructors in overriding each task rejection:

a.) Task 1 - Declinate an M2 Compass. Infrequent task performance was the reason that this task was eliminated from the FO training task list. The instructors pointed out that this task is only performed when the FO moves to a new area that requires a different set of maps. Each time the FO uses a different map, he must be sure that his compass is correctly declinated. It is a simple task, easy to learn, easy to perform and requires little training time. It is taught whenever use of the M2 compass is taught. The student does need to know how to perform this task and when to perform it if he is to use his maps and compass correctly.

b.) Task 2 - Determine direction using an M2 compass.

c.) Task 3 - Determine direction using binoculars and known references.

d.) Task 37 - Use Mils as angular measurement. The composite scores of these tasks were below the established cutoff score required for task inclusion. These tasks are frequently performed critical tasks that were rated as being not difficult to perform or learn. Typically in a task selection process, tasks rated as not difficult are not included in the training lists because the student is expected to be able to pick up the task on his own time. However, the instructors point out that these three tasks are performed by the student FO everytime he goes out on a practice exercise in FAOBC, and the instructor needs some assurance that all students have at least received a minimal level of training using the M2 compass and binoculars.

e.) Task 14 - Prepare and use a terrain sketch. Failure to exceed the composite cut-off score was the reason this task was originally rejected from the training task list. This task was rated as being only slightly to moderately critical as well as being only slightly difficult to perform or learn. When questioned about the low criticality ratings, the instructors agreed that the use of a terrain sketch was not critical to the experienced FO's mission. For most

students, however, it is a critical task because it facilitates the integration of the key elements involved in setting up a mission. Thus, preparing and using a terrain sketch is more of an enabling task than a terminal objective and should be included in the training list.

f.) Task 17 - Prepare and use an observed fire fan. This task was rejected because its composite score was two points below the minimum acceptable score. It is an easy task to perform and learn and only moderately critical. Use of the observed fire fan is a sensitive topic among FAOBC instructors. Some instructors indicated that the observed fire fan is only a crutch. Supporting information from the experienced FOs suggests that it is not always available and students should learn to conduct a fire mission without one. Other instructors at the school are adamant concerning its inclusion in the training program, stating that the observed fire fan is a very useful and helpful tool. Our decision was to tentatively reinstate the task in the FO training list.

g.) Task 26 - Determine target location by polar plot. This task did not meet the frequency of performance criterion of the task selection algorithm and, consequently, was deleted from the list. As the instructors pointed out, the polar plot method is not frequently used, by itself, but is performed as a prelude to other tasks, therefore it should definitely be included in the training list.

h.) Task 28 - Determine target location by shift from a known point using observer/target direction.

i.) Task 29 - Determine target locations by shift from a known point using a horizontal shift.

j.) Task 31 - Determine target location by shift from a known point using a lateral shift. All three of these tasks were excluded from the training list because they were not performed as frequently as required by the task selection algorithm. These tasks are very critical

tasks and the student does need to know how to perform them and under what circumstances they are to be performed. Additionally, these three tasks cannot be taught using a self-instructional program, thus they were recommended for inclusion.

k.) Task 40 - Determine distance by relative appearance of objects. The mean scale value for performance frequency for this task was below the minimum scale value required in the task selection process. However, the composite score for this task definitely exceeded the accepted value for task inclusion and the task was rated as being slightly to moderately difficult to learn which suggests that training within FAOBC is desirable. Additionally, the instructors pointed out that this task is only used when other distance judgment aids are not available, which may account for the lower frequency rating. Distance judgment by relative appearance of objects is typically taught with related distance judgment tasks, and it is our conclusion from this analysis that it should continue to be taught that way.

l.) Task 48 - Use proper radio-telephone procedures. The composite score for this task did not meet the task selection algorithm criterion. However, all of the instructors emphasized that this task is a very critical task that is frequently performed and although it is a very easy task to perform, many minor mistakes are frequently made. The instructors added that practice of this task during firing exercises helps the student to learn this task. Because of the high criticality ratings as well as the high error rate this task was retained in the training list.

m.) Task 50 - Select appropriate shell fuze combinations to yield appropriate terminal effects for the engagement of selected targets (for cannons).

n.) Task 51 - Select appropriate shell fuze combinations to yield appropriate terminal effects for the engagement of selected targets (for mortars). Both tasks failed to meet the composite score

requirement and Task 51 was not performed as frequently as specified by the task selection algorithm. These tasks, like Task 48 which was presented earlier, were rated as not difficult to perform or learn, and consequently their composite scores were attenuated enough to produce a "task reject" on the task algorithm. However, they are both very critical tasks that are performed every time the FO engages a target using cannons or mortars, and as such the student does need some formalized training in their performance.

o.) Task 54: Request and adjust fire using creeping procedures. Task 54 was rated as being performed infrequently to occasionally on the performance frequency scale -- below the specified performance rating. The reason adjusting fire using "creeping procedures" is performed infrequently in a combat exercise is that it will only be done in safety limits whenever "friendlies" are close to the target. It is not a very difficult task to learn or perform and, thus, does not require extensive training. The instructors did emphasize that the students definitely need to know the procedures of how to do it and it is desirable that they have several practice exercises on this task because it differs from the normal fire adjustment procedure.

p.) Task 61 - Report consequences of fire-for-effect on target.

q.) Task 66 - Send spot reports of intelligence to battery/battalion FDC. Neither tasks achieved the required cut-off value on the composite score. Both tasks are performed frequently during any combat exercise almost to the point that for the experienced FO, they are a matter of course. This is not so for the student FO, and, as the instructors indicate, the students need to practice when and how to accomplish these two tasks. Thus, they were retained in the task listing.

Additional comments concerning the 42 tasks that were retained in the FO task listing are included in the Training Analysis section.

4. Training Analysis

The training analysis consisted of:

- o a comparison of the outcome of the task analysis with the official, or informally included elements of the training curriculum of forward observers;
- o a presentation and integration of pertinent data from the Training Evaluation Questionnaire and the Forward Observer Questionnaire;
- o a discussion of the training implications of the profile development and task analysis activities including cost effectiveness issues as appropriate; and
- o a critique of the existing FO training materials and equipment.

Task Analysis Outcome/Course of Instruction Comparison

The Course of Instruction (COI)[1] for FAOBC was reviewed and all tasks that were identified as being taught were compiled in a single list. Trained tasks which were related to any of the 69 FO tasks from the task analysis activity were positioned adjacent to each of the 69 FO tasks which permitted the ready identification of critical tasks which were not trained as well as noncritical tasks for which training time was expended. A similar procedure was completed for the enlisted men's 13F COI. This process resulted in Table 4-1. Table 4-1 also includes an indication of the task analysis outcome, special comments, and, for ease of use, an indication of those tasks recommended by the task analysis which do not appear in the COI. The task analysis outcome column contains an "X" if the task was recommended for inclusion, either through task selection algorithm acceptance, or, through instructor override. Ninety-two tasks were extracted from the FAOBC COI and 73 from the 13F COI. Of the FAOBC COI tasks, 16 were weapons and maintenance related, 33 were non-FO/FIST Chief related tasks or leadership activities, and 14 were Fire Direction Center (FDC) tasks. Those

[1] Although official doctrine refers to Programs of Instruction (POI), the documentation for U.S. Army Field Artillery School courses were labeled "COI" and that terminology is used here.

TABLE 4-1. COMPARISON OF IDENTIFIED FO TASKS WITH THE COURSE OF INSTRUCTION FOR FAOBC AND THE COURSE OF INSTRUCTION FOR THE ENLISTED 13F COURSE.

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
1. DECLINATE AN M2 COMPASS	X		X	REVIEW PROVIDED BY COUNTERFIRE DEPT.	
2. DETERMINE DIRECTION USING AN M2 COMPASS	X	MEASURE AND PLOT AZIMUTH WITH M2 COMPASS			MEASURE GRID AZIMUTH WITH M2 COMPASS
3. DETERMINE DIRECTION USING BINOCULARS AND KNOWN REFERENCES	X		X	REVIEW PROVIDED BY COUNTERFIRE DEPT.	
4. CONDUCT A TERRAIN ANALYSIS		IDENTIFY RELIEF FEATURES		REQUIRED DURING OBSERVED FIRE EXERCISE	
	X	DEFINE THE FIVE MILITARY ASPECTS OF TERRAIN			
5. READ A MILITARY MAP	X	IDENTIFY MAP MARGINAL INFORMATION AND TOPOGRAPHIC SYMBOLS			IDENTIFY TOPOGRAPHIC SYMBOLS IDENTIFY RELIEF FEATURES
6. ORIENT A MAP USING A COMPASS					ORIENT MAP BY TERRAIN ASSOCIATION AND M2 COMPASS
7. ORIENT A MAP BY TERRAIN ASSOCIATION	X	ORIENT MAP WITH IDENTIFIED GROUND FEATURES			ORIENT MAP USING TERRAIN FEATURES ORIENT MAP BY TERRAIN ASSOCIATION AND M2 COMPASS
8. DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION	X		X	REVIEWED BY COUNTERFIRE DEPT.	DETERMINE OWN LOCATION BY TERRAIN ASSOCIATION
9. LOCATE AN UNKNOWN POINT ON A MAP BY RESECTION		MEASURE DISTANCES			LOCATE TARGETS USING INTERSECTION AND RESECTION LOCATE OWN POSITION BY RESECTION
10. LOCATE POINTS USING A SURVEY		DETERMINE LOCATIONS BY GRAPHIC INTERSECTION AND RESECTION			
11. MEASURE GROUND DISTANCES ON A MAP		DETERMINE LOCATIONS BY GRAPHIC INTERSECTION AND RESECTION			MEASURE GROUND DISTANCE

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
12. LOCATE AN UNKNOWN POINT ON A MAP BY INTERSECTION		LOCATE TARGETS BY POLAR COORDINATION AND UTM GRID COORDINATES			LOCATE TARGETS USING INTERSECTION AND RESECTION
13. MAKE A MAP RECONNAISANCE	X		X		
14. PREPARE AND USE A TERRAIN SKETCH					DRAW A PANORAMIC REPRESENTATION OF THE TERRAIN WITHIN OWN ZONE OF OBSERVATION
15. USE AN FDC PREPARED VISIBILITY DIAGRAM					
16. CONSTRUCT A VISIBILITY DIAGRAM					
17. PREPARE AND USE AN OBSERVED FIRE FAN	X		X	THE OF FAN IS WIDELY USED BUT NOT PART OF THE OFFICIAL INVENTORY	
18. USE PHOTOGRAPHS, PHOTO MAPS OR PICTOMAPS AS A MAP SUBSTITUTE OR SUPPLEMENT					
					SELECT A MOVEMENT ROUTE USING A MAP
19. NAVIGATE ON LAND BY FOOT	X		X		TRAVEL CROSS COUNTRY THROUGH SPECIFIED GROUND STATION
				PART OF THE COUNTER-FIRE DEPARTMENT REVIEW	ADJUST FIRE WHILE MOVING TO DIFFERENT LOCATIONS ON FOOT AND IN A MOTORIZED VEHICLE
20. NAVIGATE ON LAND FROM A VEHICLE	X		X	WITH MORE AND MORE MECHANIZATION AND THE FIST VEHICLE THIS WOULD APPEAR TO BE BASIC	SELECT A MOVEMENT ROUTE USING A MAP TRAVEL CROSS COUNTRY THROUGH SPECIFIED GROUND STATION
21. NAVIGATE ON LAND WITHOUT ANY AIDS SUCH AS A MAP OR COMPASS					
22. SELECT AND OCCUPY OBSERVATION POSTS	X	SELECT OBSERVATION POST		NO REALISTIC PRACTICAL EXERCISES	SELECT AND OCCUPY OBSERVATION POST
23. OBSERVE FROM A TANK-MOUNTED POSITION		ADJUST ARTILLERY FIRE WHILE WALKING FROM AERIAL PLATFORM AND IN VEHICLE			ADJUST FIRE WHILE MOVING TO DIFFERENT LOCATIONS ON FOOT AND IN A MOTORIZED VEHICLE

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
24. ACQUIRE TARGET(S)	X	LOCATE TARGETS			
		LOCATE, IDENTIFY, REPORT, AND ATTACK TARGETS IN ZONE OF RESPONSIBILITY			
25. RECOGNIZE/IDENTIFY TARGET(S)	X	LOCATE, IDENTIFY, REPORT, AND ATTACK TARGETS IN ZONE OF RESPONSIBILITY			
		DETECT, IDENTIFY, AND REPORT SIMULATED THREAT EQUIPMENT AND ACTIVITIES AND ORIENT NIGHT OBSERVATION DEVICES TO DETECT THREAT TARGETS			
26. DETERMINE TARGET LOCATION BY POLAR PLOT	X	LOCATE TARGETS		THE POLAR PLOT TARGET LOCATION PROCEDURE IS WIDELY USED EVEN THOUGH CALLS FOR FIRE USE GRID COORDINATES	LOCATE POINTS BY POLAR COORDINATES
		LOCATE TARGETS BY POLAR COORDINATES AND UTM GRID COORDINATES			
27. DETERMINE TARGET LOCATION BY GRID COORDINATES	X	LOCATE TARGETS			PLOT GRID COORDINATES
		DETERMINE AND PLOT UTM GRID COORDINATES			LOCATE A TARGET BY GRID COORDINATES
		LOCATE TARGETS BY POLAR COORDINATES AND UTM GRID COORDINATES			
28. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING OBSERVER/TARGET DIRECTIONS	X	LOCATE TARGETS			
29. DETERMINE TARGET LOCATIONS BY SHIFT FROM A KNOWN POINT USING A HORIZONTAL SHIFT	X	LOCATE TARGETS			
30. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A VERTICAL SHIFT		LOCATE TARGETS			DETERMINE ALTITUDE
		DETERMINE ALTITUDE			DETERMINE VERTICAL SHIFT

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN CGI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
31. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A LATERAL SHIFT	X	LOCATE TARGETS			
32. MEASURE AN ANGLE USING THE HAND AND FINGERS					
33. MEASURE AN ANGLE USING BINOCULARS	X		X	CONSTANTLY DONE DURING OBSERVED FIRE EXERCISES	
34. MEASURE AN ANGLE USING AN AIMING CIRCLE		LAY AN ARTILLERY WEAPON USING AN M2 AIMING CIRCLE BY THE ORIENTING ANGLE METHOD			
35. MEASURE AN ANGLE USING BATTERY COMMANDER'S PERISCOPE					
36. USE DEGREES AS ANGULAR MEASUREMENTS					
37. USE MILS AS ANGULAR MEASUREMENTS	X	MEASURE AND PLOT AZIMUTH WITH M2 COMPASS			
38. DETERMINE DISTANCE BY FLASH-BANG METHOD	X			NO SYSTEMATIC PROCEDURES FOR TEACHING DISTANCE ESTIMATION WERE NOTED. IF A PERSON IS GOOD AT TERRAIN ASSOCIATION THIS SHOULD FOLLOW, BUT TERRAIN ASSOCIATION IS NOT TAUGHT	
39. DETERMINE DISTANCE BY ESTIMATION	X				
40. DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS	X		X		
41. DETERMINE AND USE GUN-TARGET LINE AS A SPOTTING LINE		INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUPPRESSIVE FIRES, IRREGULAR SHAPED TARGETS, AND AO MISSIONS			
42. DETERMINE AND USE OBSERVER/TARGET LINE AS A SPOTTING LINE	X	DETERMINE ANGLE T			

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
43. DETERMINE AND USE CARDINAL DIRECTION AS A SPOTTING LINE					
44. CHECK COMMUNICATIONS SYSTEMS	X	INSTALL, OPERATE, AND TROUBLE-SHOOT TELEPHONES TA-132 AND MX155, ANTENNA RC-292 AND HOT LOOP			INSTALL RADIO RECEIVER R442, PREPARE FOR OPERATION AND ASK FOR A RADIO CHECK
		OBTAIN RADIO CHECKS FROM A MASTER STATION			CARRY OUT MAINTENANCE REQUIREMENTS AND TROUBLESHOOTING PROCEDURES FOR COMMUNICATION ELECTRONICS EQUIPMENT
45. REPORT POSITIONS TO FDC	X	DESCRIBE TARGET LOCATION, SHELL/FUZE COMBINATION AND PERFORM CALL FOR FIRE			
		INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUP-PRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AD MISSIONS			
46. OPERATE OBSERVER'S RADIO AND WIRE EQUIPMENT IN FIRE DIRECTION CHANNELS OF THE FA BATTERIES	X	INSTALL, OPERATE AND TROUBLE-SHOOT TELEPHONES TA-312 AND MX-155, ANTENNA RC-292 AND HOT LOOP			
		INSTALL AND OPERATE RADIO SET CONTROLS AND SPEECH SECURITY EQUIPMENT FROM BOTH LOCAL AND REMOTE INSTALLATIONS			INSTALL, PREPARE FOR OPERATION AND COMMUNICATE BY RADIO SET AN/VRC 46 FROM A REMOTE AND LOCAL POSITION USING RADIO SET AN/GRA
		OBTAIN RADIO CHECKS FROM A MASTER STATION			

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
47. USE THE CEOI TO DETERMINE CALL SIGNS, FREQUENCIES, NUMERAL CODE, AUTHENTICATION, AND ENCODING FOR THE GUIDED TEMPLATE	X	INSTALL AND OPERATE RADIO SETS, CONTROLS AND SPEECH SECURITY EQUIPMENT FROM BOTH LOCAL AND REMOTE INSTALLATIONS			
		STATE CHARACTERISTICS OF FIELD EXPEDIENT ANTENNAS			OBTAIN FREQUENCIES, CALL SIGNS AND SUFFIXES FROM CEOI AND ENTER AND LEAVE A RADIO SET USING RADIO/TELEPHONE AND AUTHENTICATING PROCEDURES
		USE THE CEOI, OPERATIONS AND NUMERAL CODE AND AUTHENTICATION TABLES			
48. USE PROPER RADIO-TELEPHONE PROCEDURES	X	USE RADIO-TELEPHONE PROCEDURES			TRANSMIT AND RECEIVE CLEAR TEXT AND CODED MESSAGES USING RADIO/TELEPHONE PROCEDURES,
49. PREPARE AND TRANSMIT A CALL FOR FIRE		CALL FOR SUBSEQUENT CORRECTIONS AND SURVEILLANCE			TRANSMIT COMPLETE CALL FOR FIRE
		DESCRIBE TARGET LOCATION, SHELL/FUZE COMBINATION AND PERFORM CALL FOR FIRE			TRANSMIT SUBSEQUENT CORRECTIONS
		INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUPPRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AO MISSIONS			
50. SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGET (FOR CANNONS)	X	DESCRIBE TARGET LOCATION, SHELL/FUZE COMBINATION AND PERFORM CALL FOR FIRE		OFTEN DONE BY THE FIRE DIRECTION OFFICER	DETERMINE HEIGHT OF BURST CORRECTIONS

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
		INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH, ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUPPRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AO MISSIONS			
51. SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGETS (FOR MORTARS)	X	DESCRIBE TARGET LOCATIONS, SHELL/FUZE COMBINATION AND PERFORM CALL FOR FIRE			
52. REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING SUCCESSIVE BRACKETING PROCEDURES		ADJUST ALL TYPES OF ARTILLERY FIRE			ADJUST FIRE USING SUCCESSIVE HASTY BRACKETING PROCEDURES
		CALL FOR SUBSEQUENT CORRECTIONS AND SURVEILLANCE			ESTABLISH RANGE BRACKET AND SPLIT
		INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUPPRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AO MISSIONS			DETERMINE RANGE CORRECTIONS
53. REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING HASTY BRACKETING PROCEDURES	X	ADJUST ALL TYPES OF ARTILLERY FIRE			DETERMINE RANGE CORRECTIONS
		INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUPPRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AO			ESTABLISH RANGE BRACKET AND SPLIT
		CALL FUR SUBSEQUENT CORRECTIONS AND SURVEILLANCE			ADJUST FIRE USING SUCCESSIVE AND HASTY BRACKETING PROCEDURES

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
54. REQUEST AND ADJUST FIRE USING CREEPING PROCEDURES	X	ADJUST ALL TYPES OF ARTILLERY FIRE		USED FOR DANGER CLOSE	DETERMINE RANGE CORRECTIONS
		INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUP-PRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AO MISSIONS		NO SIMULATED FRIEND-LIES ARE USED WITHIN THE IMPACT AREA	
		CALL FOR SUB-SEQUENT CORREC-TIONS AND SUR-VEILLANCE			
55. CONDUCT A PRECISION REGISTRATION	X	DETERMINE AND CONDUCT FIRING DATA FOR PRE-CISION REGISTRATIONS			DETERMINE RANGE CORRECTIONS
		USE REGISTRATION CORRECTION TO CONDUCT AREA FIRE MISSIONS			
56. CONDUCT A FIRE MISSION AS AN AERIAL OBSERVER		ADJUST ALL TYPES OF ARTILLERY FIRE INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUP-PRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AO MISSIONS		THIS IS PRESENTLY DONE BUT THE EXPO-SURE TO IT IS SO BRIEF AS TO BE OF OF QUESTIONABLE VALUE	ADJUST FIRE UNDER AERIAL, SMOKE, ICM, HIGH ANGLE, SUP-PRESSION, IRREGULAR, SHAPED AND OTHER SPECIAL MISSIONS
		ADJUST ARTILLERY FIRE WHILE WALKING FROM AERIAL PLAT-FORM, AND IN VEHICLE			
57. CONDUCT A SUPPRESSIVE FIRE MISSION ON A TARGET OF OPPORTUNITY	X	ADJUST ALL TYPES OF ARTILLERY FIRE		TIMING IS NOT STRESSED AS MUCH AS ACCURACY	

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
58. CONDUCT A FIRE MISSION USING SHELL ILLUMINATION	X	ADJUST ALL TYPES OF ARTILLERY FIRE INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUP-PRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AO		THOUGH OFFICIALLY IN THE COI, FIRE DAN-GER USUALLY PRECLUES ITS USE	DETERMINE MEANS OF ILLUMINA-TION COORDINATE THE FIRING OF ILLUMINATION AND HE ROUNDS
59. REQUEST AND ADJUST A QUICK SMOKE MISSION	X	ADJUST ALL TYPES OF ARTILLERY FIRE CALL FOR SUB-SEQUENT CORREC-TIONS AND SUR-VEILLANCE			
60. CONDUCT AN IMMEDIATE SMOKE MISSION	X	ADJUST ALL TYPES OF ARTILLERY FIRE INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUP-PRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AO MISSIONS			
61. REPORT CONSEQUENCES OF FIRE-FOR-EFFECT ON TARGET	X		X	THIS IS FORMALLY TAUGHT BY SOME GUN-NERY DEPT. INSTRUC-TORS, BUT WITH CAR BODIES AS TARGETS THE REALISM IS LACK-ING	
62. REQUEST AND ADJUST NAVAL GUN FIRE					
63. REQUEST IMMEDIATE OR PRE-PLANNED CLOSE AIR SUPPORT (CAS) STRIKES					

FORWARD OBSERVER TASKS	TASK ANALYSIS OUTCOME	CORRESPONDING TASK FROM FAOBC-COI	RECOMMENDED FO TASKS NOT IN COI	COMMENTS	CORRESPONDING TASK FROM ENLISTED 13F COI
64. ADJUST FIRE WITHOUT AN FDC - "BLACK MAGIC"		ADJUST ALL TYPES OF ARTILLERY FIRE			
		INITIATE AND ADJUST CALLS FOR FIRE FOR SH SMK, SH ILLUM, SH WP, HE, GT LN, CENTER OF SECTOR, SUPPRESSIVE FIRES, IRREGULAR SHAPED TARGETS AND AD MISSIONS			
65. ADJUST FIRE FOR MOVING TARGETS		ADJUST ALL TYPES OF ARTILLERY FIRE		NOT PRACTICABLE	
66. SEND SPOT REPORTS OF INTELLIGENCE TO BATTERY BATTALION FDC	X	IDENTIFY AND DISCUSS INTELLIGENCE REPORTING PROCEDURES			TRANSMIT SURVEILLANCE AND REFINEMENT DATA
		LOCATE, IDENTIFY, REPORT, AND ATTACK TARGETS IN ZONE OF RESPONSIBILITY			IDENTIFY THREAT VEHICLES AND EQUIPMENT
67. PERFORM CRATER AND FRAGMENT ANALYSIS				BRIEFLY COVERED BY COUNTERFIRE DEPT.	
68. CUE THE AN/MPQ-4A RADAR ON SUSPECTED SOURCES OF ENEMY INDIRECT FIRE					
69. USE NIGHT OBSERVATION DEVICES		DETECT, IDENTIFY, AND REPORT SIMULATED THREAT EQUIPMENT AND ACTIVITIES AND ORIENT NIGHT OBSERVATION DEVICES TO DETECT THREAT TARGETS			ADJUST FIRE DURING PERIODS OF REDUCED VISIBILITY

FAOBC COI items which did not correspond with FO tasks are listed in Table 1 in Appendix I. Table 2 of Appendix I contains a corresponding list of non-FO 13F tasks.

Dramatic variation in the level of specificity of the FO tasks identified in the COI was noted. The tasks ranged from subtask elements such as "determine angle T," to very broad all-inclusive tasks. One of the tasks was so all-inconclusive that, it almost bordered on the impossible. It was, "Determine levels of training, formulate intermediate goals, and set standards for individual and collective training with the ARTEP and SQT manuals," and would, if properly performed, obviate the need for training specialists. The variability in task specificity led to some redundancy in Table 4-1 because a single COI task may have comprised a number of specific FO tasks; that is, more than one FO task was enveloped by the broader COI listing. The same lack of specificity which lead to redundancy in the table could have allowed one to assume that certain tasks were being taught when in fact they were not. Of great importance in Table 4-1 are the marks in the, "Recommended Tasks Not in the COI," column. Each mark identifies an FO task which was not officially included in FAOBC. Some marks such as the one opposite Task 13, "prepare and use an OF fan", do not pose any problem. Despite its exclusion from the official COI, use of the OF fan is taught, and each student used the device repeatedly. Unfortunately, this was not always the case for all tasks.

From a review of Table 4-1, one may observe that many of the tasks which are not taught are related to a cluster of target acquisition and location skills which include map reading, terrain association, navigation, and distance estimation. These tasks are required for successful performance of many other FO tasks but are either not taught or only given a brief review during the Counterfire Department's map reading review. That review as presently configured consists of 3.4 hours in the classroom and 4.2 hours in the field including driving to and from the range. The AA-0201 map reading and navigation exam takes 4.2 hours.

Two other points should be noted in reviewing Table 4-1. One is that Task 50 which pertains to the selection of shell fuze combinations is a task which is usually not performed in the training environment and additionally it is a task which is often performed by the Fire Direction Officer removing it from the FO's control. The second point relates to Task 54, the use of creeping procedures. In the absence of simulated friendly positions in the impact area, such a procedure is rarely used. Hasty bracketing was clearly the preferred procedure, but there are some operational situations which might be more reasonably approximated if a simulated friendly position accompanied the target to be hit in the impact area.

Profile Development--Implications for Training

Several findings and developments from the profile development activity have important implications for the training of combat effective forward observers. Since the selection environment and restricted flow of personnel do not permit optimum application of a predictive model in the artillery officer selection process, one must take the information regarding strong predictors and attempt to identify those pertinent characteristics, experiences, and skills which can improve the training program. In the following section, these major points will be discussed.

Interclass Variability. One problem which has plagued other researchers studying the FO performance problem (WSTEA-II) and impacted our activity involved interclass variability. Wide individual differences and differences in the composition of each class may introduce error into any analysis which may affect the evaluation of criteria in particular. Many of the intermediate criteria which are closest to the ultimate criterion of successful performance in combat are the criteria which are most sensitive to slight differences in the population of interest. Problems of this kind were noted with the criteria which were simple measures of radial miss distance (RMD) in target location. Without losing sight of the fact that standards for these ultimate

criteria must be met, ways of identifying the similarities among competent young FOs were sought. The present research attempted this and performance based models of FO performance were built which are robust to changes from class to class.

Life Experience Factors. From the descriptive data and model building activity it was clear that life experience factors and interests impacted FO performance. Being from a rural environment did provide an advantage. Referring to the effect of performance differences due to being from a rural versus urban environment, one must determine what it is about being from a rural environment that is related to better FO performance. Obviously, using analytical techniques, this determination cannot be unequivocally made, but several features of the rural environment appear to overlap with features of the fire adjustment setting. One might hypothesize that a person from a rural environment would have had more exposure to open terrain than those individuals from the cities or suburbs. Thus, distance estimation may be a skill which has already been practiced and developed. Furthermore, one might hypothesize that one from a rural environment was more likely to be sensitive to terrain features than his urban counterpart. If either of these hypotheses should be confirmed, the implication is that additional exposure to those settings which improve distance estimation and terrain analysis would be appropriate. One way of achieving the additional exposure, of course, would be through additional training exercises in the field. An alternate approach would involve the increase of distance estimation training prior to FAOBC.

Math Ability. Math ability was found to be a strong predictor of FO performance, probably because of the relationship between math ability and complex problem solving. Many of the critical FO tasks seem to require higher order cognitive skills that go beyond the fixed routine of procedure following skills, requirements are discussed in the context of task classification elsewhere in this section.

Working With Maneuver Unit. The responses to the profile question in the survey of experienced Field Artillery officers revealed an important factor which was not part of formal training--working well with the maneuver unit. This ability requires one to understand maneuver unit tactics and to sell Field Artillery capabilities to the unit commander. Forward Observers and FIST Chiefs interviewed during the course of the research repeatedly stressed this same point. The importance of this factor can only be expected to grow as FIST is implemented with the concomittant change in FIST Chief/unit commander interactions.

Non-FO Tasks. Responses to one item from the FOPPQ indicated that many FAOBC students viewed administrative and other career related factors as more important than performing the basic FO/FIST Chief tasks. One can only speculate as to why this was so. Two possible reasons are: 1.) the young officer only serves as an FO for a relatively brief portion of his entire Army career; and 2.) many individuals serving as FOs or FIST Chiefs apparently spend much of their time performing other tasks. Independent of the reason for this student belief was the fact that it existed and thus should be considered in any training modifications.

Entrance Level Deficiencies. Student questionnaire data suggested that their precommission military training did not encompass all FAOBC-assumed prerequisite skills. One of the most critical deficiencies was identified to be in the area of map reading. The term "map reading" is used here generally to mean land navigation, terrain association, and distance estimation. The profile development activity clearly revealed that the map reading exam that was given early in FAOBC was a strong predictor of observed fire performance and overall success in FAOBC.

Map Reading. Several points regarding map reading skills can be made. First, map reading is not a central element in FAOBC instruction; however it is reviewed. The assumption that ROTC programs prepare officers with basic map reading skills cannot be made. Second, it may be possible to detect differences in map reading abilities early in FAOBC

or before the beginning of FAOBC. Related to the second point is a third that if one receives a low score on an exam for which he has not had adequate preparation (through no fault of his own) a motivational set which reflects the initial failure may persist and impact the acquisition of other FO skills for the remainder of FAOBC. The map reading ability of the incoming FAOBC student can, and perhaps should, be evaluated so that appropriate adaptive training measures can be applied, if necessary. This would not only provide new FAOBC students with the basic map reading skills which are essential for performance of many other FO tasks, but would eliminate some of the secondary problems resulting from starting a course with a low score.

Training Materials Evaluation

As part of the training analysis, the COI, training manuals, and training equipment were evaluated for effectiveness, format and relevance.

Course of Instruction (COI)

In the instructional system design (ISD) approach to training development (TRADOC Pam 350-30), the course of instruction is to be structured so as to facilitate training administration and operation and, as such, it should include as a minimum:

- o Course title
- o Course objective
- o Instructional lesson and module numbers
- o Time allotted for training each lesson or module
- o Criterion objectives for each lesson
- o Enabling objectives for each lesson
- o Summary of instructional approach
- o Training activities that describe what the student does, the types of media available, and the training equipment required to achieve the enabling objectives and criterion objectives
- o Instructor activities, responsibilities, teaching aids or other media which the instructor uses and guidelines to the instructor concerning how the training shall be conducted.

When the content of the FAOBC COI is compared with the suggested content of the ISD approach, the FAOBC COI was found to be rather divergent. The FAOBC course is titled, the lessons are numbered, the lesson times are indicated, and a general reference is provided. However, an evaluation of the criterion objectives showed they are poorly constructed and fail to meet ISD standards. Student activities, instructor activities, available media, textbooks, training manuals, programmed instruction, student guidelines, instructor guidelines and enabling objectives are not included, nor are they identified as being available through any other source. Additionally, it is not possible to reconstruct and evaluate the training provided in FAOBC by examining the course of instruction. Rather than dwell on what is not included in the COI, we shall concentrate on what is present; that is, the criterion objectives.

Well-defined criterion objectives include the operations the student must perform and the knowledge he must acquire in order to satisfy job performance requirements. Each criterion objective should:

(a) Explicitly state the behavior.
(b) State the conditions under which the behavior (skill) shall occur and identify necessary equipment.
(c) State the criteria under which mastery may be said to occur.

A properly written "behavior" element specifies what the trainee does, using action verbs that are:

(d) Observable.
(e) Measurable.
(f) Verifiable.
(g) Reliable.

A properly written "conditions" statement defines what the trainee "is given" by way of:

(h) Job aids.
(i) Equipment.
(j) Special tools.
(k) Environmental conditions.
(l) Manuals.

(m) Special instructions.

(n) Problem situations or contingencies.

A properly written "criterion" statement states or clearly implies a standard of performance. It shall:

(o) Specify the precise nature of the output.

(p) Specify how close to correct the performance must be.

The following two objectives are examples of typical criterion objectives that are presented in the FAOBC COI.

1. Objective:
   a. Behavior: Student will be able to initiate a correct CFF for SH smoke, SH ILL, SH WP, high angle, gun target line, center of sector, suppressive fires, irregular shaped targets and AO missions.
   b. Condition: Given note taking equipment in a classroom environment.
   c. Standard: To know how to initiate the correct call for fire and adjust for SH SMK, SH ILLUM, SH WP, HA, GT LN, center of sector, suppressive fires, irregular shaped targets and AO missions.

   Ref: FM 6-40, 6-40-5
2. Objective:
   a. Behavior: Determine the steps in locating targets.
   b. Condition: Given note taking equipment in a classroom environment.
   c. Standard: Instructor satisfaction.

   Ref: None.

The stated behaviors are not observable, measurable, verifiable or reliable. The standard in the first objective is simply a restatement of the behavior. The standard, "instructor satisfaction", in the second objective is undefined. One of the goals of the ISD approach is to standardize instruction and testing. What guarantee is provided that instructor A's "satisfaction" is the same as Instructor B's? The

students in this case are not protected from instructor bias or discrimination, and quality control of instruction cannot be assured. The second objective listed above is probably an enabling objective; however, enabling objectives are bound by the same standards as the criterion objectives.

Ammerman and Melching (1966) point out that the failure to specify performance standards may be a danger signal indicating that these standards are not known by the instructional personnel. Such inadequately designed performance objectives can result in inadequate or inefficient instruction. They add that the differences produced by the incommunicability of not just the standard but of also the poorly worded behavior and condition elements of the objective can be "...the cause of dissatisfaction on the part of students, instructors, and agencies using graduates of the instructional program..." (Ammerman and Melching, 1966, p. 18).

There were, however, several criterion objectives that did approach the standards for a well-defined objective. One such example is included below:

G002AT - Conduct of Fire
Hours - 3.4
Objective:

a. Behavior: The student will be able to prepare to observe, initiate a correct CFF, adjust artillery fire and report surveillance for area and special missions.
b. Condition: Given observed fire equipment and an artillery observed fire training device.
c. Standard:
   (1) To locate the target with a radial error of less than 200 meters.
   (2) To initiate a correct CFF within 45 seconds or less
   (3) To initiate subsequent corrections and surveillance within 10 seconds or less.

Ref: FM 6-40, 6-40-5

This objective does appear to be a well-defined objective but after closer examination it was apparent that too much information is provided in one objective. It qualifies as a course goal rather than a specific lesson objective. The above objective may be more effective if it were divided into several objectives each covering one aspect of the total objective. For example, prepare to observe would be one criterion objective; initiate a correct CFF would be a second; adjust artillery fire would be a third; and report surveillance would be the fourth.

The objectives discussed above unfortunately were not isolated examples. A requirement for additional examination of the objectives clearly emerged. However, in conducting such an examination, blind adherance to ISD procedures is not suggested. A quality ISD process can be achieved which will optimize training effectiveness within cost and time constraints which are externally imposed. Improving the quality of the criterion objectives provides a major part of an information base for knowledgable selection of courseware design alternatives.

It is clear from the brief discussion above that the FAOBC COI is not consistent with ISD standards and may require modification where feasible in order to achieve ISD standards and to be an effective instrument in the management and facilitation of instruction.

<u>Training Manuals and Training Equipment</u>

Students' evaluations of the training manuals is addressed later in this section. A brief summary of the evaluation completed by the training analyst follows:

Field Manuals, reference notes, and technical manuals served as training materials in FAOBC supplemented by training circulars, programmed texts, and video training tapes. The use of field manuals and technical publications is appropriate if a guide is available to the student that links the course and lesson objectives to the manuals by chapter and page. It was our understanding that the students received guidelines sporadically and the guidelines they did receive may only consist of

applicable sections of the COI. Without a guidebook that charts the students activities, objectives, and resources for each lesson, it may be very difficult for the student to organize his study behaviors. The field manuals and technical publications assume a level of expertise that most students do not possess; and, without a guidebook, these manuals may be very difficult to understand and follow.

The instructional materials that were presented on video-tape were also reviewed. Unfortunately, these materials did not appropriately utilize the dynamic-action capabilities of video tape and presented the instruction in a very static, lecture-type format that was frankly, boring. Imaginative techniques were not used. These tapes failed to attract the attention of the student, and provided no student participatory segments. The learning value of the video-taped materials could be enhanced by improving the design of the instruction. Many of these tapes would have been more appropriate in a sound-slide format with attractive, informative graphics to help hold the students' interest, supplemented by interspersed problem-solving tasks which would present immediate feedback to the student. A careful study of the media selection literature may be very helpful in the redesign of the self-instructional learning center materials.

Training Simulators. There are three training simulators available for use at the Field Artillery School. The observed fire trainer (OFT), used by most students, is a computer controlled optical projection system that provides classroom training in the observation and adjustment of fire and fire planning by forward observers. The present system projects a terrain scene on a screen viewed by several students who can observe with or without binoculars. Targets are included as part of the terrain scene and can be inserted by the instructor on a selective basis. When operating, this instructional tool provides an effective means of training procedures and teaching rule-following. A recent evaluation (Boyd, Martin, Garrett, Starkey, & Moler, 1978) identified several sources of reliability problems associated with the use and maintenance of the OFT. These researchers found that the device does

not operate in extreme temperatures; that the spare parts were of poor quality such that down time was increased by their malfunction; that the maintenance manual was inadequate for troubleshooting problems; and that the tool kit was inadequate for operator maintenance. In the course of their evaluation, Boyd et al., 1978, discovered that the time accrued for repair activity represented 20% of the total system time. This finding supports student and instructor reports of the variability of OFT use during the conduct of the present research. Boyd et al., 1978, concluded that the reliability of the OFT can be increased by modification of its hardware and software parameters.

The BT-33, a less sophisticated training device than the OFT, was used by only 24% of the students in FAOBC 12-78, 1-79, and 3-79. The BT-33 provides similar instruction in fire adjustment training. The 14.5mm Field Artillery Trainer M31 was also used by the students for perfecting fire adjustment procedures. Unlike the others the 14.5 trainer is a bolt-action, single-shot, rifled barrel assembly that can be mounted on a tripod. The principal differences between using this device and actual fire adjustment is that for the trainer the observer-target factor is based on 100 meters rather than 1,000 meters and it requires the construction of a special small range area and associated maps. Wind effects on the M31 trainer rounds are greater than on larger rounds, but the device is still useful for training adjustment techniques.

These training simulators provide effective and inexpensive means of training fire adjustment procedures and should be maximally utilized by the artillery training center to prepare for and supplement field training exercises.

FAOBC Instructor Evaluations

After the FO Task Analysis data were compiled and summarized for all tasks, the results of this process were discussed with instructors from the Counterfire/Survey, Basic Gunnery and Tactics Departments. As described in the Task Analysis section, these instructors partici-

pated in the task selection process. Additionally the instructors were asked to evaluate the present training of the selected tasks and identify areas where improvements were indicated. Following is a brief summary of their evaluations and suggestions.

All instructors pointed out that the COI presumes prior knowledge and ability in map reading, terrain association, and navigation skills. Except for the Marine student FO, academy graduates, and a few ROTC graduates, the students lack these skills. There was not enough time in the COI to train these individuals on these tasks. Several instructors, on their own time on the weekends, would take those students experiencing the most difficulty on map reading, terrain association and land navigation and train them on these tasks. This additional unscheduled training was enough to permit these students to perform adequately on tasks that assume proficiency in these skills and the students completed the course with satisfactory performances. It was the consensus that a minimum of an additional 15 to 20 hours of training on these tasks would be highly desirable and beneficial. It was noted at this time that eight course hours of training in land navigation was in the process of being added to OBC in May of this year; however, the instructors felt that the additional eight hours were insufficient. Some instructors voiced skepticism concerning whether or not even these eight hours would be inserted. If sufficient training in map reading, terrain association, and navigation cannot be provided within the time and cost constraints of formal courses, then a closer look at ROTC training of these skills and a formalizing of remedial training is in order.

Except for the above mentioned tasks, the instructors were in agreement with the time allotted in the COI for each task. All of the instructors impressed the MDAC-St. Louis review team with their concern and involvement in FAOBC Training. In the course of the group interviews, new techniques and approaches to common problem areas were discussed among themselves. The instructors identified novel approaches that would improve training in specific areas which, if instituted across all FAOBC training, would be very useful. For example, the problem of

training the students how to adjust fire in a danger-close situation was discussed. One instructor suggested that a point in the impact zone be identified as a friendly point, then the students are to be required to adjust fire accordingly, and be graded on their performance. The instructors at the Field Artillery School were an imaginative and dedicated group that, if called upon, were capable of evaluating and making improvements in OBC training. It was also our impression that this resource was being utilized by the school but not as fully as it may have been.

Task Analysis Interviewee Comments

Upon completion of the FO Task Analysis form, the 56 experienced FOs and FIST Chiefs were asked to comment upon FAOBC training effectiveness and the new FIST Chief concept. Their comments are summarized below.

FAOBC Training Effectiveness. Graduates of the Field Artillery Officer Basic Course at Ft. Sill, Oklahoma had varied comments regarding training effectiveness. A few officers expressed satisfaction with the quality of the FAOBC instruction they received while most were critical of some aspect of the course. Recommendations that more training time be allocated to specific task elements of the FO/FIST Chief job were noted frequently. Specific tasks mentioned were map reading, land navigation, adjusting fire, developing target lists, conducting simultaneous and multiple missions, and integrating the fire support plan with the maneuver scheme. They also suggested increasing instruction in the role of the FIST and describing how implementation would be achieved.

Performance weaknesses in vehicle maintenance and the utilization of communication equipment were identified by many of the officers interviewed. Some voiced the opinion that more vehicle maintenance training should be given because much of their time was devoted to repair activity. Expanded instruction in the use and repair of communication devices to include more troubleshooting training and exercises

with digitial communications systems was also advised. It must be remembered that the goal of the task analysis was to prioritize critical FO tasks, not to specify additions or deletions to the COI.

Additional comments indicated that some officers felt they had not sufficiently grasped all that was presented to them during FAOBC. For these men, relearning many skills and knowledges was required once they were placed in an organic unit. This lack of retention and transfer reported by many is not unexpected when so much information and training is given over a relatively short period of time, in this case, ten weeks. But if the individual possesses the ability and has the opportunity to retrain himself, then this deficiency may not be as critical.

FIST Chief Concept. When asked to give their reactions to the new FIST concept, many lieutenants commented that the Fire Support Team, in theory, was an improvement over other means of fire support but that because of personnel and equipment problems the transition to FIST was not proceeding effectively as it could. Untrained and improperly trained enlisted personnel along with a high rate of personnel turnover were identified as major problems. Recent 13F transfers to FIST teams were reported as lacking the skills required by their MOS. More senior lieutenants criticized junior lieutenants just out of FAOBC for their inability to function effectively and cooperatively as FIST Chiefs.

Equipment malfunctions and shortages were mentioned often in discussions of the FIST. One lieutenant observed that he could find only two of the four FM radios required to properly equip his FIST vehicle. Many other officers who were surveyed reported that they spend much of their time during field exercises repairing communication and transportation equipment.

Some lieutenants attribute slower acceptance of the FIST to maneuver commanders who were unfamiliar with the uses of the Fire Support Team. Conflicting demands by maneuver commanders ranged from "stay out of my way" to "give me as much support as you can and stay inside my tank and tell me where we are when I ask."

Lieutenants reflecting on their own limitations said they lacked knowledge of how to train their enlisted personnel. Proposed suggestions included increasing FIST components of FAOBC training and placing FIST training in a combined arms environment rather than in an isolated training school.

Training Evaluation Questionnaire

The Forward Observer Training Evaluation Questionnaire (PT 5268) was designed to evaluate the degree to which the students believed FAOBC prepared them for the Forward Observer duties they would perform as Field Artillery Officers, and to solicit insights which may improve the course. This questionnaire was administered to FAOBC 12-78, FAOBC 1-79, and FAOBC 3-79. A copy of the questionnaire is provided in Appendix J.

Section I of the questionnaire was a list of subject areas and tasks on which the students rated amount and appropriateness of training, effectiveness of performance, and type of training needed (classroom versus practical exercises). The student's responses to Section I of the questionnaire were tallied and the percentages for each rating column were calculated. The summary data for each column for each of the tasks by response are included in Table 1 of Appendix K. Section II of the questionnaire contained a series of open-ended questions concerning prerequisite training, estimated frequency of later skill performance, quality of instructional texts and manuals, adequacy of training equipment, and other course characteristics. Below is a summary of the responses to the questionnaire.

In examining the summary data of the students' ratings of tasks and subject areas certain characteristics of FAOBC training became apparent. When rating the tasks, a large proportion of the students, 67% and 72% respectively, indicated that the amount of training they received for the tasks, "navigate on land on foot" and "navigate on land from a vehicle", was insufficient. Accordingly, they rated the quality of the training for those tasks as generally inappropriate, 72% and 73%,

respectively, for the two types of land navigation. As would logically follow they rated their performance on these two tasks as ineffective. These navigational tasks received the lowest ratings of any tasks on the list.

The students may have overrated the effectiveness of their performance on all tasks since their ratings tended to range from moderately to very effective. Despite this, relative rankings of performance effectiveness strongly suggest that the students recognize that their ability to navigate is below what it should be. This lower performance level on navigational tasks was entirely consistent with the opinions expressed by instructors who were interviewed at Fort Sill and experienced Artillery Officers who responded to the Forward Observer Questionnaire. Both groups of officers indicated that the lieutenants coming out of FAOBC were deficient in their map utilization and navigational skills. The students' responses to the type of training needed for these two tasks indicated that more practical exercises in the field were necessary to acquire proficiency in navigating on land.

Other tasks highlighted by the students' responses included measuring angles using the hand and fingers, determining distance, conducting terrain association, selecting and occupying observation posts, and performing the technical and supervisory skills of the FIST Chief. Indications from the students were that for these skill areas and tasks, the amount of training they received was inadequate, but that the type of training they did receive was very appropriate. Using this information, one may argue for expanded coverage of these few tasks in FAOBC.

As previously stated, the students perceived the quality of their performance across all tasks as being moderately effective to very effective. Their ratings must be evaluated on a relative scale. The tasks on which the students rated their performance as being most effective included: measuring angles using binoculars, using the observed fire fan, using military maps, determining target location by polar plot and by grid coordinates, and preparing and transmitting the

call for fire. Likewise, the students rated the quality of the training they received for these tasks as being moderately to very appropriate. One might infer from the mean ratings (as distinct from relative ratings) that the students were having little difficulty learning and performing these tasks. Other data collected do not support this implication. Although the students described their performance of these tasks in OBC as being very effective, these reports are inconsistent with OBC instructors' evaluations of performance and with actual performance as reflected in their observed fire grades. Also, the students' perceived proficiency in utilizing maps and locating targets is not manifested once these officers begin their post-instructional assignments. This conclusion is reinforced by those officers whose opinions were sampled via the Forward Observer Questionnaire.

With respect to the tasks specifically assigned to the FIST Chief, the students evaluated this training as inadequate in amount of both classroom and practical exercises. Similarly, they viewed their FIST-related training as being moderately appropriate and indicated that their performance in the role of FIST Chief was only moderately effective. This trend in the students' responses to the training and performance of FIST Chief skills suggested that there was a need to modify and clarify this aspect of FAOBC training.

In Section II of the questionnaire, the students were first asked to list those skills taught in FAOBC for which prerequisite training was needed. Table 4.2 presents a summary of their answers rank ordered by frequency of response. Map reading was named by over 50% of the students who recognized it as the most complex skill for which prerequisite training was required. Terrain association, with 55 responses and land navigation with 30 responses ranked second and third to map reading, but did not approach it in terms of frequency of response. A subquestion of the first open-ended item asked the students whether or not the required training had been provided prior to FAOBC. The nature of these data did not lend themselves to statistical tests of significance; however, it was obvious from inspection of the responses that the

TABLE 4-2

Responses to the request,
"List the skills taught in OBC for which prerequisite training was needed."*

	Number of Responses
Map reading	229
Terrain Association	55
Land Navigation	30
Use communication equipment	27
Use compass	27
Locate targets	27
Math	27
FDC procedures	26
Leadership	17
Understand Army/Unit organization	14
Use slide rule	12
Determination of distance	8
Call for Fire	7
Military bearing	6
Role of FIST	6
Maintenance procedures	5
FO procedure/skills	4
Supply procedures	3

*Data from Forward Observer Training Evaluation Questionnaire (PT 5268) administered to OBC 12-78, OBC 1-79, and OBC 3-79. N = 442.

answers to this question varied by source of commission. Graduates of the U.S. Military Academy reported in every case that they had received the requisite training before beginning the Officers' Basic Course. Those students who were members of the U.S. Marine Corps also affirmed that in most instances they too had previously obtained the necessary foundation for FAOBC. Many of the Marine officers stated that this instruction was part of the Basic School training they had completed at the Marine Corps Development and Education Command, Quantico, VA. The majority of ROTC, OCS, and NGUS officers acknowledged having had preparatory instruction before entering the Field Artillery School but also expressed a need for more and better precommission training. This information suggested the existence of a relationship between source of commission and quality of precommission training. A minimum level of proficiency standing among the FAOBC student population can be ensured by pretesting entrants to the school and giving those students whose scores fell below a predetermined cutoff score remedial course work.

The reader might recall that earlier a relationship was established between a map reading practical exam (AA-0201) administered after only three days of FAOBC training and successful performance in observed fire components of FAOBC. A similar exam could easily be developed for administration prior to FAOBC. In fact, the present AA-0201 exam could be used in its present form as a screening device. The problem with that approach is that identifying time slots for remedial training after the beginning of FAOBC is very difficult. If, however, a need for remedial training is identified prior to FAOBC then a broader set of training alternatives is available.

Answers to the next subquestion, "Was this training provided in earlier segments of OBC?" revealed no differential effect when broken out by source of commission. One might infer from their responses that the students did receive some prerequisite instruction in terrain association and map reading initially during FAOBC but again many of their comments indicated that training was too brief.

Understanding basic military information is fundamental to successful performance in any military job. Were the FAOBC students aware of any deficiencies in their knowledge of military information which hindered their performance in OBC? Marines, USMA graduates, officers from OCS and those from the National Guard reported few or no academic problems due to mistaken knowledge of Army organizations and their workings; however, ROTC commissioned officers indicated that they could have done better in the Tactics and Combined Arms subcourse with a more accurate understanding of basic military information.

Next, students were asked to list those skills they thought they would use most often as a Field Artillery Officer, and, which, if any, they expected to seldom or never use. This was asked not only to assess students' perceptions of the importance of various components of FAOBC, but also to identify factors potentially influencing students motivational level. Their responses indicated that students envisioned spending most of their time performing maintenance tasks, operating the Fire Direction Center, and performing related gunnery tasks. Except for a relatively small number of students who predicted that some tasks will never be performed, most anticipated that all of the skills they learned in FAOBC will be used. Table 4-3 presents a rank ordering of the responses to this question. One may note in Table 4-3 that the students listed those skills acquired through the study of tactics and combined arms operations as least likely to be performed. The next most frequently listed items were: performing FO tasks and procedures and leading the fire support team. One might assume from these responses that the students did not expect to be performing as FOs in actual combat. This assumption regarding the improbability of a ground war may have some motivational implications. The responses may also reveal an illusion about the actual importance of certain tasks. Clearly, the FO in Viet Nam survived by the strength of his abilities to acquire targets and to direct fire upon them. It was likely that some students completing the Training Evaluation Questionnaire (TEQ) perceived the performance of FO skills and procedures as extraneous abilities that were to be acquired merely for the sake of passing FAOBC. Such a

TABLE 4-3

Responses to the question, "Of the skills taught in OBC, which do you think you will use most often as a Field Artillery Officer?"*	
Maintenance procedures	161
Fire Direction Center operation	138
Gunnery (general)	109
FO procedures/skills	49
Supply procedures	44
Observed fire procedures	35
Tactics and combined arms operations	32
Leadership/management	24
Weapons operation	22
Fire Support Team operation	21
Use communication equipment	19
Map reading	14
Filling out forms	10
Laying a battery	6
Terrain association	6
Executive officer duties	5
Motor Officer duties	4
Target location	3
Use of the FADAC	3

Responses to the question, "Which skills, if any, do you think you will seldom or never use?"	
None	84
Tactics and combined arms operations	53
FO procedures/skills	22
Fire support team operation	14
Gunnery (general)	12
Counterfire skills	11
Leadership/management	10
Use communication equipment	9
Crater analysis	8
Fire direction center operation	6
Observed fire procedures	6
Use electronic sensors	4
Acquire targets	4
Use of Nuclear, biological and chemical defensive equipment	4
Determine call for fire	3
Motor Officer duties	3

*Data from Forward Observer Training Evaluation Questionnaire (PT 5268) administered to OBC 12-78, OBC 1-79, and OBC 3-79. N = 442.

perception may explain why a large proportion of the students believed they would spend most of their time handling maintenance problems and procedures, as reflected in their answers to the first part of Question three as presented in the left hand column of Table 4-3. Additionally, they failed to recognize the importanc and frequency of combat exercises that they would encounter once they were attached to a unit. The junior lieutenant is usually assigned primary duties as an FO or FIST chief. The FAOBC students were made aware of this, but informal communication channels led them to have other expectations. In some cases, the FAOBC student may have been looking beyond his first assignment.

With respect to their supposition that they would seldom or never use the FIST related tactical operations in their future assignments, the students may simply have been reflecting the stage of development of FIST. They may be responding as they did because information regarding the FIST was, ambiguous and incomplete.

Question four of the Forward Observer TEQ contained a list of training equipment on which the students were to indicate those items of equipment they did not use, the adequacy of those they did use, and to include any comments or recommendations about their use. A summary of the data for FAOBC 12-78, FAOBC 1-79, and FAPBC 3-79 are included in Table 4-4. The salient feature of these data was that most students found the training equipment they used to be adequate. It also demonstrated that of those students who answered this questionnaire, 29 percent did not use the OFT and 76 percent had no training on the BT-33. This failure to utilize these training simulators may have been due to reliability problems which plagued the OFT initially but appeared to have been solved at a later point. As for the BT-33, its low frequency of use may have reflected problems in scheduling student and instructor time.

The binoculars used by the students were criticized for not being equivalent to those used by instructors. Although the maps were rated as adequate, many students would have liked to use newer maps with a

TABLE 4-4

STUDENT EVALUATION OF ADEQUACY OF TRAINING EQUIPMENT*
(CELL ENTRIES ARE PERCENTAGES)**

	Inadequate 1	2	3	4	Adequate 5	Did Not Use
Binoculars	8	8	10	9	62	0
Observed Fire Trainer	6	4	9	9	44	29
BT-33 (Trainer)	5	2	2	2	7	76
Radio Equipment	7	10	18	12	52	1
Maps	9	7	12	15	58	0
Aiming Circle	4	7	11	16	61	1
Observed Fire Fan	2	2	5	11	79	0

*Data from Forward Observer Training Evaluation Questionnaire (PT 5268) Administered to OBC 12-78, OBC 1-79 and OBC 3-79. N = 442.

**Total percentages may deviate from 100 due to failure of some subjects to respond to a particular item and due to rounding.

scale of 1:25,000 (students presently use 1:50,000 maps). The instructors used maps with the scale of 1:25,000 as well. There was too little practice using the OFT, BT-33 and radio equipment in the opinion of a sizable number of officers.

The amount of unnecessary or redundant instruction was assessed in Question five. With very few exceptions those responding to this item said there were no elements of FO training which could be labelled repetitious or needless. Some students reported that frequent reiteration of critical information occurred but that for these few, this practice was essential in order to have complete comprehension. Leadership seminars were viewed by a small sample of Marines as superfluous, citing previous instruction they had received in the Basic School.

In Question six the students were asked if the time they spent observing one another's performance in field exercises increased their abilities or improved their skills. Approximately 90% of those who answered this question indicated that they did benefit from this training experience. The following subquestion was worded, "How could the students maximize the improvements gained from this instructional methodology?" Field Artillery instructors and students stated that the students themselves should be more attentive when not actively participating in each mission. Additionally, the students felt that more critical discussion involving all of those who have witnessed a mission should be conducted by the instructor. Other student suggestions included having the instructor shift responsibility for performing components of the fire adjustment tasks from student to student; watching an experienced and proficient FO conduct a mission; and, making the student perform two consecutive missions.

In an attempt to identify those areas of FAOBC in which the students felt improvements were needed, question seven was composed. In this question, the students were asked to describe how they would change any aspect of the course to enhance its training effectiveness.

The most frequent student recommendations were to have more and different kinds of shoots and to increase the number of practical exercises for all skills. Table 4-5 is a rank ordering of their responses to this question.

As can be seen in Table 4-5, the students recommended having more gunnery instruction, more shoots, more practical exercises, reducing class size, and extending the length of the coursealong with including more shoots and practical exercises. These last two suggestions would be desirable in any institutionalized training environment, however, the added cost and time necessary to implement such can be quite prohibitive. These restrictions may be overcome by designing a more integrated training package which would serve to keep down training materials costs.

Question eight asked the students to evaluate the examinations they completed in FAOBC. With respect to the face validity of these tests 50 percent of the students indicated that the exams reflected the quality of their skills and abilities. They described the tests as comprehensive, covering all areas of instruction in depth and emphasizing those skills and knowledges most critical to performance. Some students reported that the exams as nearly as possible simulated a "hands-on" performance test. Thirty-one percent were not pleased with the precision of the tests they took, claiming that no paper and pencil measure can accurately represent performance. Other students commented that the tests were too easy and measured little more than one's ability to memorize. Some students felt that they were merely taught how to pass tests with very little emphasis on transferring knowledge learned in the classroom to performance in the field. This student bias is not unusual in a high density instruction program where there was so much to be tested, but it may also reflect more than this. If the priority tasks as determined by the appropriate application of a task selection algorithm were taught then students should learn the appropriate skills. Sometimes, however, it is easier for an instructor to teach to a test. This may be a secondary effect of inadequately defined criterion objectives. In the absence of good criterion objectives, test items may be substituted for training objectives.

TABLE 4-5

Responses to the question,
"If you could change any aspect of the course to improve it,
what would you change and how?"*

	Number of Responses
More shoots	55
More practical exercises	54
More gunnery instruction	17
Reduce class size	15
Extend course duration	14
More training on OFT and 14.5-MM trainer M31	12
Delete formations	9
More maintenance instruction	7
Reduce grade pressure	6
Resequence classes	5
Change grading system	5
More free time	5
More FIST training	4
Improve leadership seminars	3
Offer clases in public speaking	3
Make study hall optional	3

*Data from Forward Observer Training Evaluation Questionnaire (PT 5263) administered to OBC 12-78, OBC 1-79 and OBC 3-79. N = 442.

The second part of question eight dealt with the use of the examination as a learning experience. Forty-seven percent of the FAOBC students answered the question, but the examples that were given as explanations for their answers implied a broader interpretation of the question than was intended. The question was intended to evaluate the learning value of the specific testing experiences, but many students focused on the evaluative nature of the exams. Many comments were about how the tests were critiqued by instructors; e.g., "mistakes were identified," "showed you what you should have studied," and "pointed out areas in which you were weak." Those students (27%) who replied "no" to this question may have better understood its intended purpose. On the whole, their comments were of two types: tests were too predictable in that they approximated classroom exercises and homework, and the examinations required only recall of lecture and reading material.

The quality and usefulness of the texts and manuals assigned in FAOBC were rated by the students when responding to question nine. Fifty-nine percent of the students rated the materials as appropriate and good, 22 percent felt they were poor or inadequate, and 19 percent gave no response. Also within Question nine, the students were asked to list those references, training manuals, and instructional supplements which they found most useful as well as those they found to be of little or no use in the course. About ten percent of the sample said that all of the reading materials were necessary and helpful in completing FAOBC. The most useful materials to the students were the reference notes which explained in detail some of the critical components of FAOBC training, e.g., duties of the forward observer and the procedures of how to adjust fire. Student opinions of the field manuals (FM) were mixed. The general reaction to FMs would suggest that they were not as helpful as reference notes. However, the students did indicate that FM 6-30, 6-40, and 6-40-5 were the most useful field manuals in the course. This response was understandable since the content of these three FMs was most pertinent to the FAOBC curriculum. Technical Manuals (TM) were given rather poor ratings by the students compared to the ratings of other instructional manuals. Programmed texts (PT), workbooks (WB),

handouts (HO), and training circulars (TC) received more favorable ratings than the TM's by the students. These findings suggested that students preferred to use shorter, more concise texts, such as RNs, PTs, etc. than the longer, more comprehensive texts like field and technical manuals. Many students failed to appreciate the utility of FMs and TMs which, though infrequently used during FAOBC, serve as excellent and frequently accessed references once the students have assumed their duties with a maneuver unit.

The last subitem of question nine directed the students to identify those specific FO skills and tasks for which additional reference materials were needed. Table 4-6 presents a summary of the students' responses. Those students responding to this question strongly indicated no requirement for supplemental reference materials. Obviously most students felt the existing FAOBC manuals and texts provided a sufficient information base for the development of FO skills and tasks. A few tasks were identified by the students as needing additional reference materials. These included: observed fire procedures, determination of target location, map reading, distance estimation, laser range finder usage, and terrain association. The frequencies assigned these tasks by the students were quite small and most likely did not represent a deficiency in the quality or thoroughness of OBC manuals and texts that pertained to these skill areas. Some students also indicated they needed more literature that explained the operation, composition, training, and supervision of the Fire Support Team (FIST). Although not components of the traditional FO job, operating and managing the FIST requires many skills that the FO has always performed. Keeping in mind that the FIST concept is new and taking into consideration the comments from officers interviewed at Ft. Hood, Texas, who reported many problems in implementing the FIST, it appeared that there is a requirement for literature concerning training and implementation which more clearly delineates the workings and responsibilities of the FIST.

TABLE 4-6

Responses to the question,
"Which specific skills/tasks need additional reference materials?"*

	Number of responses
None	147
The operation, composition, training, and supervision of the FIST	9
Observed fire procedures	8
Target location	5
Map reading	4
Determination of distance	4
Use laser range finder	3
Terrain association	3

*Data from Forward Observer Training Evaluation Questionnaire (FT 5268) administered to OBC 12-78, OBC 1-79, and OBC 3-79. N = 442.

In question ten the students were asked if they were given enough information concerning the quality of their performance to know what they did wrong and how to improve it. Fifty-seven percent of the students affirmed that they did receive constructive criticism regarding deficient performance. Many of these students qualified their answers with comments such as, "only in gunnery," "only in tactics, "you had to ask for help", and "would liked to have had more critiques." Eighteen percent of the students said they were not provided with enough information to permit them to improve their performance. One student from this group said, "I was told I would get better with more practice, but none was ever provided." Another student said, "I was told what was wrong but not how to change it." Most of this 18 percent said that they were not shown their tests after they were graded. Twenty-five percent of the students failed to answer this question. The answers to this question indicated that, despite policy, there were no standard procedures for providing remedial instruction for students who were doing poorly and that only those students who actively sought help from instructors received assistance. An implication of this is that an improved guidance or counseling program is needed which can be used to detect and correct problems before they become serious. This will be discussed in more detail later. It was clear that some instructors assumed the responsibility of identifying and assistings students, but this tended to be done on an informal basis.

The last question, number eleven, asked the students if the feedback they received from instructors facilitated amelioration of errors in performance. Almost two-thirds of the students indicated that instructors' comments were helpful in improving performance. Many of these students said that most of the instructors were willing to answer the students questions. Only 12% said that they could not make improvements in their performance based on feedback from the instructors. These students stated that clarification of questions in problem areas came too late to affect final grade. As in question ten, 24 percent of the students gave no response. One might also note that from the

interviews there were indications that most instructors were genuinely concerned about the quality of Field Artillery Officers that graduated from OBC and that they took the opportunity when offered them to help the students learn to perform to the best of their abilities.

Forward Observer Questionnaire

The FOQ asked experienced artillery officers how they would change training to improve FO and FIST Chief performance. Their most frequent recommendation was to increase the number of field training exercises. They also suggested that more live shoots be included in training and that the FO, in the traditional sense, perform at the training setting in support of a maneuver element. For the FIST Chief they suggested that he too must train more with the infantry and armor units for which he must coordinate fire support. Another recommendation was to expand and integrate map reading exercises with terrain association training in the field. The officers who responded to the FOQ also felt more practice using simulators such as the OFT, BT-33, and 14.5mm M31 trainer would benefit the FO and FIST Chief. Because communication equipment provided a critical function in the successful completion of the artillery mission, it was also suggested that those in training who will assume the FO or FIST Chief role receive more extensive electronic trouble shooting instruction as well as more hands-on training with communication equipment. They specifically advised that the FIST Chief learn how to train the members of his team to perform their respective duties. Other noteworthy suggestions were to train all members of the fire support team together and to provide more instruction in land navigation.

In the first open ended question of the FOQ, experienced Field Artillery officers were asked what were the most important skills for accomplishing the FO tasks. As can be seen in Table 4-7, map reading was by far the most frequent response followed by fire adjustment and communications tasks. These tasks correspond well with tasks which emerged from the task analysis activity. Some "soft skills" also appeared

Table 4-7 Responses to the question, "What are the most important skills and abilities a recent FAOBC graduate needs to effectively perform FO component tasks of the FIST Chief job?" (Cell entries are the number of responses)

	LT	CPT	CPT-V*	MAJ	MAJ-V*	TOTAL
Sample Size	108	57	46	48	73	332
Map Reading	53	24	19	25	42	163
Adjust Fire	32	18	18	19	24	111
Communications/RTO Procedures	30	18	9	8	18	83
Locate & Identify Targets	20	15	7	20	10	62
Understand & Work Well with Manuever Unit	23	9	5	6	13	56
Calls for Fire	25	6	4	7	7	49
Fire Planning	18	6	3	4	8	39
Land Navigation	9	4	3	5	9	30
Training Others	8	5	3	6	8	30
Leadership	9	4	2	4	10	29
Terrain Association	9	6	3	1	8	27
Communication Equipment	6	7	5	4	4	26
Fire Support Coordination	8	2	4	5	6	25
FO Procedures/Skills	5	6	-	3	9	23
Know Weapons Systems	6	2	5	2	7	22
Estimate Distance	1	1	-	1	4	7
Pass on Intelligence	1	1	1	-	-	3
Select & Occupy Observation Post	1	1	1	-	-	3

*The "V" indicates that this sample has had Viet Nam experience.

in the list of important FO skills generated from the FOQ responses. Soft skills are those skills, which emerge from a task allocation process during the design of a job, without specific predesignated action requirements. At least three soft skill items appear in the list in Table 4-7. They are understand and work well with maneuver unit, training others, and leadership.

It is clear from the responses that maneuver unit coordination requirements are very important. This skill, like leadership, may be very difficult to train. When asked to indicate which tasks FOs performed best and which they performed worst, the responses summarized in Tables 4-8a and 4-8b emerged. It can be seen that understanding and working well with the maneuver unit was near the top of the list of tasks performed most poorly. This takes on special importance because, under the emerging FIST concept working well with maneuver unit may be even more important than it has been for the traditional FO role. This important soft skill is not taught in FAOBC. Among those things which would facilitate good interactions with the maneuver unit and which could be taught in FABOC would be special training in maneuver unit tactics. Since working well with the maneuver unit like leadership is a soft skill, there is necessarily difficulty in defining what should be taught in this area. The emphasis placed on this skill by the FOQ respondents and their assessment of it being poorly performed serve, in conjunction, to identify a training requirement which may need extensive examination.

What has been noted elsewhere about map reading is reinforced by the FOQ responses. Map reading was rated as the most important FO skill and also as the skill performed most poorly.

Another open-ended question of the Forward Observer Questionnaire asked experienced Artillery officers if their precommission training adequately prepared them for FAOBC training and, if not, which skills were lacking. Fifty-five percent of the sample indicated that they had

Table 4-8a Responses to the question, "Of those important skills and abilities, which are performed best?"

	LT	CPT	CPT-V	MAJ	MAJ-V	TOTAL
Sample Size	108	57	46	48	73	332
Adjust Fire	29	11	15	16	23	94
Calls for Fire	20	4	4	4	5	37
Map Reading	15	4	3	1	2	25
Communications/RTO Procedures	6	4	2	3	5	20
Locate & Identify Targets	7	5	2	3	-	18
FO Procedures/Skills	4	4	4	31	5	17
Know Weapons System/Gunnery	2	4	2	3	2	13
Fire Planning	6	-	1	-	1	8
Communications Equipment	2	-	-	-	2	4
Determine Azimuth (Use Compass)	3	-	-	1	-	4
Land Navigation	2	2	-	-	-	4
Fire Support Coordination	1	-	2	-	-	3
Know Equipment	-	-	-	-	2	2
Understand & Work Well with Maneuver Unit	1	-	1	-	2	2
Leadership	2	-	-	-	-	2
Engage Enemy	-	-	-	1	-	1
Terrain Association	-	-	1	-	-	1
Shift from Known Point	-	-	1	-	-	1
Map Reading in Urban Areas	1	-	-	-	-	1
Know Tactics	1	-	-	-	-	1

Table 4-8b Responses to the question, "Which are performed most poorly?"

	LT	CPT	CPT-V	MAJ	MAJ-V	TOTAL
Sample Size	108	57	46	48	73	332
Map Reading	24	9	13	14	25	85
Locate & Identify Targets	12	4	5	5	7	34
Understand & Work Well with *Manuever Unit*	11	4	6	1	5	27
Fire Planning	12	2	2	2	8	26
Communications/RTO Procedures	12	2	5	3	1	23
Leadership	6	2	3	-	6	19
Training Others	6	3	3	1	4	17
Fire Support Coordination	5	1	-	4	6	16
Communications Equipment	4	3	3	3	1	14
Land Navigation	4	2	-	2	5	13
Terrain Association	4	2	3	2	1	12
Maintenance	4	1	3	4	-	12
Adjust Fire	4	1	2	-	-	7
Know Weapons System	3	-	1	2	1	7
Estimate Distance	1	-	-	-	5	6
Calls for Fire	5	-	-	-	-	5
Know Special Situations	4	-	-	-	-	4
Provide Intelligence Data	1	1	1	-	-	3
Camouflage/Survivability	1	-	-	-	-	1
Adjust Fire While Moving	1	-	-	-	-	1

the necessary foundations for FAOBC, 29% felt they were insufficiently prepared, and 11% did not attend FAOBC. About one-third of the officers who reported that their precommission training was deficient said that they were ill-prepared to receive training in all components of Field Artillery instruction. Specific skill areas for which precommission training were inadequate included: map reading, fire direction center operation, communications, land navigation, mathematics, and fire adjustment. Additionally, those who indicated that they had experienced any deficiencies were asked if they had been able to readily overcome them and if so, in what manner. Eighty percent said that through much practice, extra studying, and on the job training they were able to rectify their inadequacies. Only 20% indicated that they could not easily make up for their deficiencies in their precommission training.

The 332 officers who returned the FOQ provided an evaluation of the type of training needed for each task. For the 21 tasks listed, the officers were asked to indicate which four types of training would be most appropriate in the artillery instruction and unit environments. The four categories were classroom training, simulator training, formal field instruction, and field exercises. These data are summarized in Table 4-9. Note that more than one type of training could be indicated for each task. Some overall observations may be noted. With the unit, field exercises and formal field instruction (structured training given in a field environment or as part of a field exercise) were the preferred training techniques. Some tasks, most notably map reading and prepare and transmit a call for fire were thought to appropriately require both classroom training and field training at the unit. Simulator use, overall, received low ratings, but procedural tasks such as preparing and transmitting calls for fire and adjusting fire received the highest ratings in this area. This is entirely consistent with conclusions reached from observations of the OFT in use. It appears to be very effective as a procedures trainer, but cannot completely substitute for field training even for the procedural skills.

Table 4-9

ARTILLFRY OFFICER EVALUATION OF THE TYPE OF TRAINING NEEDED FOR FORWARD OBSERVER TASKS*
(CELL ENTRIES ARE PERCENTAGES+)

TASK		IN OBC				WITH UNIT			
		CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE	CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE
1. USE AND REPAIR COMMUNICATION EQUIPMENT.	2 & 1LT	78	12	54	41	50	5	51	69
	CPT	73	25	54	47	30	5	37	84
	CPT-V	91	17	61	59	39	2	39	89
	MAJ	85	19	63	60	31	15	50	85
	MAJ-V	79	18	66	41	23	8	41	94
	COMBINED	80	17	59	47	36	7	45	82
2. DETERMINE DIRECTION USING A COMPASS.	2 & 1LT	30	5	82	52	18	2	62	77
	CPT	47	9	77	49	14	2	46	86
	CPT-V	72	20	83	74	24	9	41	96
	MAJ	75	13	83	58	29	4	50	88
	MAJ-V	66	3	73	60	12	1	41	93
	COMBINED	53	8	80	57	18	3	50	86
3. MEASURE ANGLE USING HAND AND FINGERS.	2 & 1LT	35	5	71	39	24	3	58	64
	CPT	44	9	72	42	21	9	39	75
	CPT-V	70	87	70	61	24	7	35	83
	MAJ	58	4	71	48	23	4	44	75
	MAJ-V	49	1	73	44	14	13	40	78
	COMBINED	48	5	71	45	21	5	45	73
4. MEASURE ANGLE USING BINOCULARS.	2 & 1LT	37	24	77	53	23	12	61	73
	CPT	51	39	77	56	21	16	46	86
	CPT-V	76	17	80	76	24	13	43	91
	MAJ	67	17	88	54	21	15	60	79
	MAJ-V	52	22	85	45	16	7	48	89
	COMBINED	52	24	81	55	21	12	53	82

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283).
+SAMPLE SIZES ARE AS FOLLOWS: 1 & 2LT (N=108), CPT NO VIET NAM EXPERIENCE (N=57), CPT VIET NAM EXPERIENCE (N=46), MAJ NO VIET NAM EXPERIENCE (N=48), MAJ VIET NAM EXPERIENCE (N=73), COMBINED SAMPLE (N=332).

Table 4-9 (Cont.)

ARTILLERY OFFICER EVALUATION OF THE TYPE OF TRAINING NEEDED FOR FORWARD OBSERVER TASKS*
(CELL ENTRIES ARE PERCENTAGES+)

TASK		IN OBC				WITH UNIT			
		CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE	CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE
5. DETERMINE DISTANCE BY FLASH-BANG METHOD.	2 & 1LT	31	18	69	45	19	18	52	69
	CPT	46	23	56	58	14	9	46	72
	CPT-V	54	24	67	56	20	7	35	83
	MAJ	58	33	67	42	21	23	52	63
	MAJ-V	44	21	67	48	15	10	37	87
	COMBINED	43	22	66	49	18	14	45	75
6. DETERMINE DISTANCE BY ESTIMATION.	2 & 1LT	14	6	79	65	[illegible]	6	62	80
	CPT	25	23	81	68	14	12	51	91
	CPT-V	48	15	80	83	24	9	41	96
	MAJ	33	13	94	60	10	10	65	81
	MAJ-V	29	15	81	62	14	7	58	95
	COMBINED	27	13	82	67	13	8	57	87
7. DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS.	2 & 1LT	14	13	79	55	7	12	60	71
	CPT	23	30	75	65	12	14	40	88
	CPT-V	33	24	80	70	17	11	39	89
	MAJ	33	27	83	52	8	17	60	75
	MAJ-V	26	30	73	58	12	16	53	88
	COMBINED	23	23	78	59	11	14	52	81
8. PREPARE AND USE OBSERVED FIRE FAN.	2 & 1LT	65	15	65	51	43	6	62	66
	CPT	72	23	74	51	30	11	44	82
	CPT-V	85	17	80	72	43	11	46	85
	MAJ	83	21	73	48	35	15	63	73
	MAJ-V	82	14	71	45	30	10	48	79
	COMBINED	75	17	71	52	37	10	54	75

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283).
+SAMPLE SIZES ARE AS FOLLOWS: 1 & 2LT (N=108), CPT NO VIET NAM EXPERIENCE (N=57), CPT VIET NAM EXPERIENCE (N=46), MAJ NO VIET NAM EXPERIENCE (N=48), MAJ VIET NAM EXPERIENCE (N=73), COMBINED SAMPLE (N=332).

Table 4-9 (Cont.)

ARTILLERY OFFICER EVALUATION OF THE TYPE OF TRAINING NEEDED FOR FORWARD OBSERVER TASKS*
(CELL ENTRIES ARE PERCENTAGES+)

TASK		IN OBC				WITH UNIT			
		CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE	CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE
9. READ AND INTERPRET A MILITARY MAP.	2 & 1LT	77	14	71	70	58	12	63	82
	CPT	93	23	67	70	53	16	53	91
	CPT-V	89	22	85	83	52	13	65	96
	MAJ	88	19	79	63	44	17	56	85
	MAJ-V	86	14	82	71	48	12	60	97
	COMBINED	85	17	76	71	52	14	60	89
10. LOCATE POINTS ON A MAP.	2 & 1LT	65	13	73	67	46	12	63	80
	CPT	79	23	70	60	51	11	56	84
	CPT-V	87	22	72	83	48	13	50	93
	MAJ	77	15	83	60	42	13	56	92
	MAJ-V	74	18	78	68	44	11	59	93
	COMBINED	73	17	75	67	46	12	58	87
11. DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION.	2 & 1LT	37	7	83	69	24	6	68	83
	CPT	46	18	86	72	30	14	53	95
	CPT-V	67	17	87	85	41	11	50	98
	MAJ	54	15	90	65	25	13	63	85
	MAJ-V	53	14	85	70	32	7	60	97
	COMBINED	49	13	86	71	29	9	60	91
12. NAVIGATE ON LAND ON FOOT.	2 & 1LT	20	2	71	73	12	4	60	81
	CPT	25	5	68	72	18	5	42	96
	CPT-V	43	9	80	87	24	2	48	98
	MAJ	33	8	83	73	17	4	58	90
	MAJ-V	36	3	75	77	15	1	48	100
	COMBINED	30	5	75	76	16	3	52	92

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283).
+SAMPLE SIZES ARE AS FOLLOWS: 1 & 2LT (N=108), CPT NO VIET NAM EXPERIENCE (N=57), CPT VIET NAM EXPERIENCE (N=46), MAJ NO VIET NAM EXPERIENCE (N=48), MAJ VIET NAM EXPERIENCE (N=73), COMBINED SAMPLE (N=332).

Table 4-9 (Cont.)

ARTILLERY OFFICER EVALUATION OF THE TYPE OF TRAINING NEEDED FOR FORWARD OBSERVER TASKS*
(CELL ENTRIES ARE PERCENTAGES+)

TASK		IN OBC				WITH UNIT			
		CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE	CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE
13. NAVIGATE ON LAND FROM VEHICLE.	2 & 1LT	17	4	73	75	13	5	55	90
	CPT	25	9	70	74	18	7	42	98
	CPT-V	33	9	74	83	15	4	41	96
	MAJ	33	10	77	75	13	6	52	94
	MAJ-V	36	10	66	75	11	4	45	97
	COMBINED	27	8	72	77	14	5	48	94
14. DETERMINE TARGET LOCATION BY TERRAIN ASSOCIATION.	2 & 1LT	28	25	81	70	19	20	68	82
	CPT	30	28	84	68	19	12	56	91
	CPT-V	57	26	85	80	26	13	48	98
	MAJ	46	23	92	65	17	17	58	92
	MAJ-V	38	21	81	64	16	14	53	95
	COMBINED	37	24	83	69	19	16	58	90
15. SELECT AND OCCUPY OBSERVATION POST.	2 & 1LT	37	0	73	62	19	1	60	87
	CPT	54	4	74	65	25	2	42	95
	CPT-V	67	9	85	85	30	4	43	93
	MAJ	52	8	75	75	25	6	58	88
	MAJ-V	55	3	71	71	16	0	47	97
	COMBINED	50	4	75	70	22	2	52	92
16. RECOGNIZE AND IDENTIFY TARGET(S).	2 & 1LT	62	44	57	50	54	37	52	64
	CPT	51	53	63	60	35	26	46	79
	CPT-V	72	62	78	78	48	22	48	83
	MAJ	67	35	83	63	33	31	56	85
	MAJ-V	58	34	84	56	29	22	48	92
	COMBINED	61	41	71	59	41	29	50	78

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283).
+SAMPLE SIZES ARE AS FOLLOWS: 1 & 2LT (N=108), CPT NO VIET NAM EXPERIENCE (N=57), CPT VIET NAM EXPERIENCE (N=46), MAJ NO VIET NAM EXPERIENCE (N=48), MAJ VIET NAM EXPERIENCE (N=73), COMBINED SAMPLE (N=332).

Table 4-9 (Cont.)

ARTILLERY OFFICER EVALUATION OF THE TYPE OF TRAINING NEEDED FOR FORWARD OBSERVER TASKS*
(CELL ENTRIES ARE PERCENTAGES+)

TASK		IN OBC				WITH UNIT			
		CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE	CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE
17. DETERMINE TARGET LOCATION BY POLAR PLOT.	2 & 1LT	51	19	79	61	36	16	68	74
	CPT	67	46	67	58	28	25	47	89
	CPT-V	83	24	83	72	39	15	46	91
	MAJ	77	25	83	54	40	23	67	75
	MAJ-V	74	22	84	58	29	12	59	88
	COMBINED	67	26	79	60	34	17	59	82
18. DETERMINE TARGET LOCATION BY GRID COORDINATES.	2 & 1LT	45	32	84	69	30	25	68	83
	CPT	65	51	79	65	26	32	53	93
	CPT-V	85	30	83	85	37	15	52	93
	MAJ	63	29	90	63	33	27	69	85
	MAJ-V	67	25	85	63	37	18	59	97
	COMBINED	61	33	84	68	32	23	61	90
19. PREPARE AND TRANSMIT CALL FOR FIRE.	2 & 1LT	80	36	71	64	56	29	60	80
	CPT	86	54	63	61	40	32	49	88
	CPT-V	89	33	76	80	52	11	43	96
	MAJ	77	35	88	63	50	29	65	88
	MAJ-V	85	34	70	60	41	25	52	88
	COMBINED	83	38	73	65	49	26	55	86
20. ADJUST FIRE.	2 & 1LT	56	45	74	73	41	39	64	83
	CPT	61	65	77	63	35	40	51	91
	CPT-V	80	59	78	91	33	35	50	98
	MAJ	67	60	85	65	38	52	67	85
	MAJ-V	59	63	81	64	25	48	58	95
	COMBINED	63	57	78	71	35	42	59	89

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283).
+SAMPLE SIZES ARE AS FOLLOWS: 1 & 2LT (N=108), CPT NO VIET NAM EXPERIENCE (N=57), CPT VIET NAM EXPERIENCE (N=46), MAJ NO VIET NAM EXPERIENCE (N=48), MAJ VIET NAM EXPERIENCE (N=73), COMBINED SAMPLE (N=332).

Table 4-9 (Cont.)

ARTILLERY OFFICER EVALUATION OF THE TYPE OF TRAINING NEEDED FOR FORWARD OBSERVER TASKS*
(CELL ENTRIES ARE PERCENTAGES+)

TASK		IN OBC				WITH UNIT			
		CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE	CLASSROOM	SIMULATOR	FORMAL FIELD INSTRUCTION	FIELD EXERCISE
21. REPORT POSITIONS TO FDC.	2 & 1LT	48	14	66	62	30	12	51	81
	CPT	58	19	47	63	21	9	32	91
	CPT-V	65	15	59	91	28	9	43	98
	MAJ	54	15	67	73	29	15	52	92
	MAJ-V	53	5	48	64	19	3	41	92
	COMBINED	54	13	58	68	26	9	45	89

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283).
+SAMPLE SIZES ARE AS FOLLOWS: 1 & 2LT (N=108), CPT NO VIET NAM EXPERIENCE (N=57), CPT VIET NAM EXPERIENCE (N=46), MAJ NO VIET NAM EXPERIENCE (N=48), MAJ VIET NAM EXPERIENCE (N=73), COMBINED SAMPLE (N=332).

Task Analysis Implications for Training

In this section, the results of the FO Task Analysis as it impacts training design are discussed, first with respect to skill/behavior type and second, with respect to FAOBC instructors and experienced FOs' insights. It is important at this point to reemphasize the fact that the FO segment of FAOBC is a general knowledge level course and, as such, the graduates of this course cannot be expected to be well-versed in all the subtleties of the job. Not all of the officers who complete FAOBC become FOs or FIST Chiefs but those who do typically complete an advanced level course before assignment as an FO or FIST Chief. Thus, certain higher order FO skills should not be included in FAOBC-- there is a more appropriate place for them to be taught-- and this fact served as the foundation for the task analysis.

FO Task Categorization

In order to determine the general skill level requirements of the FO job, a task classification scheme was developed. Several task classification schemes used in earlier ISD training efforts were examined for application to the present effort and they were found to be inadequate because of the restricted scope and range of tasks and jobs that were studied. Most of these task classification schemes (Cf., Gagne, 1962) gave little attention to complex higher order cognitive tasks that seemed to be a part of the FO job. After a review of the relevant training literature a new task classification scheme was developed specifically for the FO job. Below is a discussion of the FO task classification.

Upon completion of the task selection process, the selected tasks were divided into groups of similar tasks by behavior type and labelled with a term that best described each task grouping. Five task groups were the end result of this process. The task groups encompassed the following activity types: discrimination tasks, procedure-following tasks, rule-using tasks, problem-solving tasks and tasks involving cognitive/spatial integration skills. Table 4-10 is a listing of the selected tasks by each activity type.

Table 4-10

FO TASK SKILL CATEGORIZATION

DISCRIMINATION	PROCEDURE-FOLLOWING	RULE-USING	PROBLEM-SOLVING	COGNITIVE/SPATIAL INTEGRATION
Recognize/Identify Target(s)	Declinate an M2 Compass	Determine Direction Using an M2 Compass	Prepare and use a terrain sketch	Conduct a terrain analysis
	Use Mils as angular measurements	Read a military map	Select and occupy observation posts	Orient a map by terrain analysis
	Check communications systems	Determine Direction Using Binoculars and known References		Determine Self-location by terrain association
	Report positions to FDC	Prepare and use an observed fire fan		Make a map reconnaissance
	Operate observer's radio and wire equipment in fire direction channels of the FA batteries	Acquire target(s)		Navigate on land by foot
		Determine Target location by Polar Plot		Navigate on land from a vehicle
	Use the CEOI to determine call signs, frequencies, numeral code, authentication, and encoding for the guided template	Determine Target location by grid-co-ordinates		
	Use proper radio-telephone procedures	Determine target location by shift from a known point using observer/target directions		
	Prepare and transmit a call for fire	Determine target locations by shift from a known point using a horizontal shift		
	Send spot reports of intelligence to Battery/Battalion FDC	Determine target location by shift from a known point using a vertical shift		
		Determine target location by shift from a known point using a lateral shift		
		Measure an angle using binoculars		
		Determine distance by estimation		

Table 4-10
FO TASK SKILL CATEGORIZATION (CONT'D)

DISCRIMINATION	PROCEDURE-FOLLOWING	RULE-USING	PROBLEM-SOLVING	COGNITIVE/SPATIAL INTEGRATION
		Determine distance by relative appearance of objects		
		Determine and use observer/target line as a spotting line		
		Select appropriate shell/fuze combinations to yield appropriate terminal effects for the engagement of selected target (for cannons)		
		Select appropriate shell/fuze combinations to yield appropriate terminal effects for the engagement of selected targets (for mortars)		
		Request and adjust area fire (HE: Q, VT, TI, ICM) using hasty bracketing procedures		
		Request and adjust fire using creeping procedures		
		Conduct a precision registration		
		Conduct a suppressive fire mission on a target of opportunity		
		Conduct a fire mission using shell illumination		
		Request and adjust a quick smoke mission		
		Conduct an immediate smoke mission		

A. Discrimination. Only one task was categorized as being primarily a discrimination task and it involved the recognition and identification of targets. Tasks that involve discrimination skills require the individual to determine the differences between or among two or more stimuli and then to respond differently to each stimulus. As Butler (1972) points out, discrimination on a gross level where the differences are clearly defined is a relatively simple task but when the stimuli closely resemble each other, it can be a very difficult task. It is obviously a very critical task for the FO to be able to discriminate enemy targets from friendly troops and equipment. The more varied the number of allied troops on both sides that are involved in combat, the more complex the task can become. Training in FAOBC should be directed to the more general or gross skill level and the more refined, precise type of target discrimination should be relegated to the unit level.

B. Procedure-Following Task. The second task behavior category was procedure-following which involves the combination of motor and verbal chaining skills. Procedure-following is the linking together of a series of discriminable responses in a particular order. According to Butler (1972) the recall of the operational procedure becomes dependent upon a chain of responses linked together by both verbal and motor cues. In the FO task categorization scheme, nine tasks fit the description of the procedure-following classification. Because most of these tasks were rated as being very simple to perform, many did not meet the composite score criteria and would not have been included in the training task list if they had not been subject to instructor override. It is clear that these tasks are easy to perform and easy to learn but a lot of rehearsal and practice is involved in committing their performance to an almost rote level of competency. This rehearsal and practice can probably best be provided in FAOBC.

C. Rule-Using. The largest group of tasks was the rule-using category which included 24 tasks. This is not surprising since learning to use rules comprises a large proportion of the specific knowledge that must be acquired during most types of training. Rule-using behavior

requires the individual to learn to perform tasks according to a set of rules or principles. The key to training an individual on rule-using tasks is to provide a number of opportunities in which he can apply the rules, not merely state what the rules are. In theory, the gunnery field exercises should serve this purpose. However, it was our experience when observing firing exercises that only one student performs the task and the other students observe rather passively if at all. If these exercises were redesigned so that all students were more involved in the performance of the task, more practice in rule application may result. One way this might be handled is for instructors on some shoots to have one student indicate the initial target location, another student give the first adjustment, and so on. For this technique to work, however, the instructors would have to maintain constant control to suppress potentially disruptive actions. A second and simpler way this might be handled is to require students to record a location and indicate the adjustments they would make at each step. Even if these were not formally graded they could serve to focus student attention on the firing exercises and also be an aid to instructors in identifying students who require special assistance.

Additionally those FO students who had received extensive training in either science or mathematics where rule application is practiced more than it would be in a liberal arts program may have developed a rule-use learning strategy that may enhance their ability to learn these 24 tasks. It is possible that those individuals who have not been trained in the disciplined application of principles may need additional practical exercises and remedial training to achieve certain perceptual criteria. Because the task analysis effort and the profile development endeavor were performed concurrently, it was not possible to ascertain if individuals with better rule-application skills perform better in FAOBC specifically. However, one finding of the profile development effort indicated that those students who were mathematics majors in college performed better in FAOBC. A job sample approach using the OFT, or a similar simulator may serve as a selection device to identify those with the requisite skills (see profile development section for a discussion of the the job sample approach).

The WSTEA-II Study identified the problem of rule-using strategy as a possible source of decreased FO effectiveness and their solution was to provide the student FO with a card, listing the rules applicable to a given task. The results of this study indicated no significant differences between the group who had the card and those who did not. What was not done was to increase the number of exercises in which the student was required to apply the set of rules nor was the quality of the exercises improved, which may, in fact, be the important variables in rule-use training.

D. Problem-Solving. In this application, problem-solving was defined as the ability to solve a novel problem by combining and applying previously learned rules. In the FO training lists, only two tasks met this definition - selecting and occupying an observation post and preparing and using a terrain sketch. Each time the FO is placed into a new setting he must apply the rules that govern these two tasks. Frequent, meaningful practice sessions are the keys to learning these two tasks. Sufficient practice is provided in preparing and using a terrain sketch. However, little if any practice is provided in selecting and occupying observation posts. Students are taken out to the ranges, perched on the side of a hill and told to adjust fire. An instructor may point out to the class that this is not the way to select and occupy an observation post but never once is the student required to apply the rules for this task. Obviously, then, if students are to be proficient in this task they need to practice it and the shoot exercises are the only vehicles for so doing.

E. Cognitive/Spatial Integration. All of the six tasks included in the cognitive/spatial integration category combine problem solving skills with an ability to both convert three-dimensional spatial cues into a two-dimensional projection and analyze the results. These six tasks are the building block tasks of the FO job. If a field artillery officer cannot locate the target or himself he cannot adjust fire. Target and self location involve terrain association and map reading

skills. Interestingly enough, these basic tasks are not taught in FAOBC. Officer students are expected to be able to perform these tasks prior to FAOBC and, consequently, only a quick review is presented by the Counterfire Department at the beginning of the course. For those students who possess the related terrain association skills and can perform these six tasks, the quick review is sufficient and they are prepared for training as an FO. Those students who do not have these skills begin FO training with a deficit which can not be compensated for, and they are likely to experience difficulties with many aspects of FO training. As pointed out earlier in this section, there can be motivational questions that arise for students who do poorly on the map reading tests at the beginning of FAOBC. All of these problems may be avoided by selecting individuals who possess terrain association skills. Although desirable, this solution is not practical at this time. A second solution may be to identify those individuals who do not possess these skills and provide additional training for these individuals at the beginning of the course. A candidate test may be derived from the enlisted man's 13F FO course, which includes a heavy emphasis on terrain association, land navigation and target location tasks at the beginning of the course. Also, as indicated earlier, the ANA02 exam in FABOC should be a useful aid in developing such a test. Identifying the students who do not process these prerequesite skills may require the development of a system shich will provide remedial training for those who need it the most. This could conceivably result in a dual track system. The result, however, would be individuals who are proficient at all levels of FO tasks.

As was noted in the task analysis section, task difficulty by combat scenario differences were particularly relevant for terrain association, land navigation, map reading and distance estimation tasks. Currently within FAOBC, little attention is given to the training of these differences. Other than highlighting the scenario differences combined with a discussion of their procedural impact, FAOBC may not be the most appropriate place for instruction in scenario

differences. The FIST Chief that is assigned to a unit in Europe does not need to be concerned with the nuances of target location in a jungle environment. An alternative to the FAOBC resident school approach may be the development of instructional packages for each scenario on those tasks that demonstrated relevant scenario differences. These packages could be used at the unit level. Only those units which were to be involved in performing the tasks in a particular scenario would receive the additional training on those tasks that demonstrated increased task difficulty for that combat scenario.

Training Analysis Summary, Implications, and Options

The FO training analysis indicates that the training and selection issues summarized below should be given further serious consideration. The implications are grouped into eight categories.

1. Application of Findings to Training Development. Research methodology and procedures have been developed which can be used to improve the training development and design process used at the USAFAS, especially for FAOBC.

Several data sources converge to suggest that training emphasis can and should be adjusted to enhance the training of map reading, land navigation, terrain association, and distance estimation skills. Increasing the number of practical exercises has been suggested at all levels in the present analysis. This, of course, is dependent on time and resource availability. If resource limitations preclude such an expansion, then the importance of maximizing the training value of the existing training exercises is mandated. Although increased training of these skills appears reasonable, it is important to note that simply adding more training is not sufficient. Furthermore, changes which include proven training techniques would be effective for enhancing the training of these critical skills. For example, restructuring practical exercises to maximize student participation should be useful for this purpose. Also, structuring opportunities for frequent and accurate feedback should help to make the limited training time more valuable.

Shifts in training emphasis which would improve the quality of graduates from FAOBC could also result from a revision of the FAOBC COI to reflect the inputs of the Field Artillery officers who participated in the FO task analysis. Their inputs resulted in a task prioritization which differed from that used in the FAOBC COI. Revision of the COI might also reflect improvement in the training criteria. If proper training criterion objectives are defined, then instructors would have an easier job, and performance objectives could be used to help direct independent study. Revision of the training criteria could be done in conjunction with the development of combat referenced performance measures. Data from both the profile development and task analysis activities have been reported, and they provide a base from which these changes can be made.

Because of the differences in task difficulty which were indicated for different scenarios, training packages for each basic scenario could be valuable. These might be appropriate for all students, or alternately, they could be used for those students expected to assume duties outside of the general or European scenario.

Recommendations from experienced Field Artillery officers regarding the importance of working well with maneuver units suggest that more intense combined arms training, especially for the FIST, may be necessary. One approach to providing this additional training which would not require extensive expenditure of time and resources may be to have Armor and Infantry instructors teach selected course segments. This suggestion is not necessarily restricted to Tactics and Combined Arms Department offerings, but it is clear that this would be where such training would be most valuable.

2. Precommission Career Counseling. Low manpower levels generally limit the utility of personnel selection devices. A device such as the FO Personal Profile Questionnaire could be effectively used for another valuable purpose even in an environment with low personnel to job slot

ratios. The FOPPQ or data derived from the use of that device could serve as a tool which could be used in a selection/recruiting approach in ROTC to encourage Field Artillery career decisions.

3. Counseling During FAOBC. In addition to counseling in the pre-commission environment, benefits might be gained from a counseling activity at the USAFAS. Such a program could rely not only on instructors, but it could also utilize Advanced Officer Course (AOC) Battlefield Research Program students in conducting tutorial research counseling projects. A counseling activity would not only benefit FAOBC students who require assistance but could provide a communication channel to school officials when problems due to instruction (as distinct from problems due to individual deficiencies) exist. The FOPPQ could be developed into a useful counseling tool for problems stemming from individual differences and as such could be an enhancement to the overall counseling program.

4. Motivational Factors. Not only did students who scored low on the initial map reading exam start FAOBC with low scores, several of them reported that they felt that they were behind from the start. Several things might be done to improve the attitudes of FAOBC students. Two approaches seem reasonable. The first involves the recognition of student accomplishment in the FO related skills. This could be done using citations or certificates. Something as simple as an FO-shooter medal might be appropriate. That might lead not only to goal directed behavior, but it might serve to emphasize the importance of target location and fire adjustment. The second approach might fit well with both a counseling program and remedial training program. It would involve early skill assessment which could be used to motivate early recognition of self-modification needs. If conducted in a non threatening way, students could seek self improvement before a motivational problem developed.

Student comments indicated that a sizeable number of them had difficulty putting various components of FAOBC training in perspective

and did not have a good source of course objectives available to them. Providing a course manual could remedy both of these problems and could also serve a useful motivational function. If the students know specific performance objectives and how these objectives relate to an integrated course content, they can adjust their efforts to achieve a specific goal. A course guide could thereby be an effective study guide.

5. Supplemental Training. Assessment techniques could be used for eliminating failures in FAOBC and for insuring proper levels of training for incoming students. These techniques would serve to identify those needing remedial training and to circumvent this need if possible by improving skill levels. Assessment batteries could be developed for administration prior to the beginning of formal FAOBC instruction. If developed, they could be used to identify those individuals who lack FO essential abilities and skills, particularly on map reading and land navigation skills. Also, it might be reasonable to develop pre-FAOBC training in FO essential skills for those who demonstrate they they need it. This would probably impact some ROTC programs since data collected in the present study suggest that deficits are more frequent among ROTC students.

6. Instructor Workshops. Inputs from instructors during the course of the present research made it clear that they are both dedicated and competent. In order to maintain the highest level of competence, to assist new instructors in getting up to speed, and to provide a better opportunity for communication between departments, workshops for FAOBC instructors might be useful. If such workshops were developed, careful planning of content and well conceived scheduling would be imperative in order to make such activities beneficial and not create undue strain for the instructors.

7. Self-Instruction and Simulation. The task selection algorithm provided a prioritized list of FO tasks. Self-instruction packets could be designed to extend the breadth and depth of training for those students desiring additional information and to provide information

and did not have a good source of course objectives available to them. Providing a course manual could remedy both of these problems and could also serve a useful motivational function. If the students know specific performance objectives and how these objectives relate to an integrated course content, they can adjust their efforts to achieve a specific goal. A course guide could thereby be an effective study guide.

5. Supplemental Training. Assessment techniques could be used for eliminating failures in FAOBC and for insuring proper levels of training for incoming students. These techniques would serve to identify those needing remedial training and to circumvent this need if possible by improving skill levels. Assessment batteries could be developed for administration prior to the beginning of formal FAOBC instruction. If developed, they could be used to identify those individuals who lack FO essential abilities and skills, particularly on map reading and land navigation skills. Also, it might be reasonable to develop pre-FAOBC training in FO essential skills for those who demonstrate they they need it. This would probably impact some ROTC programs since data collected in the present study suggest that deficits are more frequent among ROTC students.

6. Instructor Workshops. Inputs from instructors during the course of the present research made it clear that they are both dedicated and competent. In order to maintain the highest level of competence, to assist new instructors in getting up to speed, and to provide a better opportunity for communication between departments, workshops for FAOBC instructors might be useful. If such workshops were developed, careful planning of content and well-conceived scheduling would be imperative in order to make such activities beneficial and not create undue strain for the instructors.

7. Self-Instruction and Simulation. The task selection algorithm provided a prioritized list of FO tasks. Self-instruction packets could be designed to extend the breadth and depth of training for those students desiring additional information and to provide information

redundant with basic FAOBC offerings. These packets could be used for remedial training during FAOBC and for extension or unit training. Extra time could be made available on the OFT or other simulators for those students requiring additional or individualized instruction in call for fire procedures. Certain individualized instruction assets might reasonably be made available to ROTC, OCS, and other students who have indicated an interest in the Field Artillery branch. Self-instruction packets might be used within or independent of the Automated Instructional Management System (AIMS). Within AIMS it might be reasonable to provide FO/FAOBC self-paced, intensive testing and retention modules. Those modules could, of course, be used for refresher work at the unit.

8. Equipment Changes. Observations by instructors and responses by students indicate a general dissatisfaction with the student binoculars. An argument can be made that if the students perform adequately with the lower quality student binoculars they should be able to perform better with the binoculars they will be issued in the field. But that argument may not hold. Lower quality training equipment may serve to accent a student's role as "merely a student," and may also make the difficult fire adjustment tasks even more difficult. This could lower overall performance. The phasing in of operational quality binoculars, as replacements are needed, may be a reasonable way to eliminate this potential problem. Additionally, change to operational use of the lensatic compass suggests that this is the compass with which students should train. This change appears to be evolving as more lensatic compasses become available.

The reader is reminded that the preceding items are not recommendations, but rather are implications and options which emerged from the research. As such they are important only in the context of improving the combat effectiveness of forward observers.

REFERENCES

Ammerman, H. L. and Melching, W. H. The derivation, analysis and classification of institutional objectives (HumRRO Tech. Rep. 66-4). Alexandria, VA: Human Resources Research Organization, May 1966. (NTIS No. AD-633 474)

Birnbaum, A. H., Rosenburg, N., White, R. K., and Willemin, L. P. Validation of potential combat predictors: ZI results for combat engineer (PRB Technical Note 79). Washington, D.C.:Personnel Research Branch, Adjutant General's Office, July 1957.

Birnbaum, A. H., White, R. K., Rosenburg, N., and Willemin, L. P. Validation of potential combat predictors: ZI results for Armor (PRB Technical Note 78). Washington, D.C.:Personnel Research Branch, Adjutant General's Office, July 1957.

Boyd, E. H., Martin, J. F., Garrett, W. A., Starkey, J. E., and Moler, C. G. Independent evaluation report for development test II of the observed fire trainer (OFT) device 3E42 (Final Rept.). Aberdeen Proving Ground, MD: Army Test and Evaluation Command, December 1978 (NTIS No. AD-B032 386L).

Butler, F. C. Instructional systems development for vocational and technical training. Englewood Cliffs, NJ: Educational Technology Publications, Inc., 1972.

Domingue, J. C. The U.S. Army tactical fire direction system (TACFIRE) (AIAA Paper No. 73-418). Fort Belvoir, VA: U.S. Army Computer Systems Command, April 1973.

Draper, N. R., and Smith, H. Applied regression analysis. New York: Wiley, 1966.

Edgerton, H. A. and Graham, W. R. The identification of observable factors related to success in combat or simulated combat (PRS Rpt. 918). Washington, DC: Personnel Research Section Program, December 1951.

Eschenbrenner, A. J., and Taylor, C. L. Forward air controller (FAC) visual training. Volume I: Analysis and specification of the essential elements of the FAC visual reconnaissance task (Report MDC E0043). St. Louis, MO: McDonnell Douglas Corporation, November 1969.

Haggerty, H. R., Johnson, C. D., and King, S. H. Evaluation of mail-order ratings on combat performance of officers. Personnel Psychology, 1959, 12, 597-605.

Helme, W. H., Willemin, L. P., and Grafton, T. C. Prediction of officer behavior in a simulated combat situation (Research Report 1182). Arlington, VA: U.S. Army Research Institute for the Behavioral and Social Sciences, March 1974.

Johnson, C. D., Burke, L. K., Loeffler, J. C., and Drucker, A. J. Prediction of the combat proficiency of infantrymen (PRB Technical Report 1093). Washington, DC: Adjutant General's Office, Personnel Research Branch, July 1955.

Johnson, C. D., Haggerty, H. R., King, S. H., and Klieger, W. A. Prediction of combat effectiveness of military academy graduates (PRB Tech. Research Note 32). Washington, D.C.: Adjutant General's Office, Department of the Army, November 1954.

King, S. H., Campbell, J. L., Johnson, C. D., Kleiger, W. A., and Yaukey, D. W. Studies of the performance of officers in combat I. Relationship of West Point measures to later combat effectiveness (PRS Report 969). Washington, D.C.: Personnel Research Section, Personnel Research and Procedures Branch, Adjutant General's Office, Department of the Army, August 1952.

Laveson, J. I. and DeVries, P. B. Forward air controller - Tactical air command pilot communication orientation (Final Technical Report MDC E0888). St. Louis, MO: McDonnell Douglas Corporation, August 1973.

Letchworth, G. A., Ragan, T. J., Stansell, V., and Huckabay, K. Evaluation of forward observers. Ft. Sill, OK: U.S. Army Field Artillery School, Department of Evaluation, September 1978.

Long, G. E., and Varney, N. C. Automated pilot measurement system (AFHRL-TR-75-58). Lackland AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, September 1975. (NTIS No. AD-A018 151).

Nelson, A. E., Marco, R. A., and Banks, A. L. Character profile of the West Virginia Coal Mines: Analysis of demographic, personal, attitudinal, and academic achievement data. In A training analysis approach to the education of coal miners (Appendix C, MDC E1566). St. Louis, MO: McDonnell Douglas Corporation, August 1976.

Taylor, C. L. and Eschenbrenner, A. J. Forward air controller visual reconnaissance training manual. St. Louis, MO: McDonnell Douglas Corporation, February 1970.

Taylor, C. L., Eschenbrenner, A. J., and Valverde, H. H. Development and evaluation of a Forward Air Controller (FAC) visual training program (TR AFAL-TR-70-190). Wright-Patterson AFB, OH: Air Force Avionics Laboratory, Air Force Systems Command, September 1970.

Thomas, A. S. Ground observer target acquisition capability: Analysis and interpretation of data from two field experiments (AMS AA-TR-125). Aberdeen Proving Ground, MD: U.S. Army Materiel Systems Analysis Activity, June 1976.

U.S. Army Combat Developments Command Experimentation Command. Ground observer probabilities of acquisition/adjustment (USACDCEC Exp. 31.1, Vol. 1). Fort Ord, CA: U.S. Army Combat Developments Command Experimentation Command, September 1968. (NTIS No. AD-841 633)

U.S. Army Field Artillery School. Cannon launched guided projectile cost and operational effectiveness analysis (ACN 18812). Fort Sill, OK: Author, March 1975.

U.S. Army Field Artillery School. Weapon system training analysis - The forward observer, phase 1A, baseline (Vol. 1, ACN 32750). Fort Sill, OK: Author, May 1977.

U.S. Army Field Artillery School. Weapon system training effectiveness analysis - the forward observer, phase II (ACN 32750). Ft. Sill, OK: U. S. Army Field Artillery School, November 1978.

U.S. Training and Doctrine Command. Interservice procedures for instructional systems development, executive summary and model (TRADOC Pamphlet 350-30). Fort Monroe, VA: Author, Headquarters, August 1975.

Willemin, L. P., Birnbaum, A. H., and Rosenberg, N. Selection of experimental predictors for longitudinal validation in combat arms (PRB Tech. Research Note 72). Washington, D.C.: Adjutant General's Office, Personnel Research Branch, June 1957.

Willemin, L. P., Birnbaum, A. H., and Rosenberg, N. Validation of potential combat predictors: Research plan of longitudinal study (PRB Tech. Research Note 73). Washington, D.C.: Adjutant General's Office, Personnel Research Branch, June 1957b.

Youngling, E. W., Levine, S. H., Mocharnuk, J. B., and Weston, L. M. Feasibility study to predict combat effectiveness for selected military roles: Fighter pilot effectiveness (MDC E1634). St. Louis, MO: McDonnell Douglas Corporation, April 1977.

ANNOTATED BIBLIOGRAPHY

Allan, M. D. The sargeant system of recognition as an approach to the learning of perceptual skills. <u>Occupational Psychology</u>, 1958, <u>32</u>, 245-252.

Reports on a study of a system of aircraft recognition training which leads to a discussion of wider problems in the teaching of perceptual skills.

Allan, M. D. Training in perceptual skills. <u>Occupational Skills</u>, 1957, <u>31</u>, 113-119.

This paper is an attempt to link up some of the more recent views about the nature of perception with the learning of recognition skills, and to isolate some of the factors which appear to determine success.

Alschuler, A. S., Tabor, D., and McIntyre, J. <u>Teaching achievement motivation</u>. Middletown, Conn.: Educational Ventures, 1970.

American Psychological Association. <u>Standards for educational and psychological tests</u>. Washington, D.C.: Author, 1974.

Ammerman, H. L. <u>A model of junior officer jobs for use in developing task inventories</u> (HumRRO Tech Rep. 65-10). Alexandria, VA: Human Resources Research Organization, November 1965. (NTIS No. AD-624 048)

Procedure was based on a model of officer job behavior, illustrating the nature and sequence of tasks performed to attain specific goals within each area of responsibility.

Ammerman, H. L. and Melching, W. H. <u>The derivation, analysis and classification of institutional objectives</u> (HumRRO Tech. Rep. 66-4). Alexandria, VA: Human Resources Research Organization, May 1966. (NTIS No. AD-633 474)

Study makes a distinction between terminal and enabling performance objectives.

Anglian, R. <u>81-mm mortar fire control techniques with laser rangefinder (Final Report) (C)</u> (TD/MOR/14). Warminster, England: Infantry Trials and Development Unit, July 1973. (NTIS No. AD-529 377)

(U) Preliminary assessment simulating the use of the laser rangefinder indicated a savings of time and ammunition of about 50% compared to current grid procedure.

Ansbro, T. M. Commonality as a factor in skills transferability. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Discusses usefulness of commonality in training, manpower management, and performance testing.

Anstey, R. L. and Division Staff. Visibility measurement in forested areas (Special Report S-4). Natick, Mass.: U.S. Army Natick Laboratories, Earth Sciences Division, 1964.

Test of system to measure visibility that can be used by field observer without elaborate equipment and with minimum advance training.

Arima, J. K. and Young, Lt. P. A. A culture-free performance test of learning ability. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Discusses the need for and development of culture-free assessment techniques in the selection programs of the Military.

Aume, N. M. Estimation of target locations with conventional measurement units (AMRL-TR-69-21). Wright-Patterson AFB, Ohio: Aerospace Medical Research Laboratory, September 1969. (NTIS No. AD-700 060)

Study of human ability to estimate lateral distances from an identified point.

Aume, N. M. Human ability to estimate target locations with respect to two points (AMRL-TR-69-44). Wright-Patterson AFB, Ohio: Air Force Systems Command, Aerospace Medical Research Laboratory, November 1969. (NTIS No. AD-701 389)

Study of forward air controllers (FAC) in estimating target location; and a comparison of polar and rectangular coordinate systems to locate target using two reference points.

Aume, N. M. Human estimation of proportional distances and distance of ratios (AMRL-TR-70-78). Wright-Patterson AFB, Ohio: Aerospace Medical Research Laboratory, June 1971. (NTIS No. AD-730 283)

The use of reference distances and ratio estimation greatly reduce between subject variability. Author suggests the use of a physically present reference distance for communicating the location of obscure points.

Aversano, F. M. and Poole, D. H. Performance testing in the SQT. Symposium at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Discusses importance of using performance testing in assessing job competence.

Bailey, H. H. Target detection through visual recognition (RM-6158-PR). Rand Corporation, February 1970.

Presents a model for describing analytically the capabilities and limitations of a human observer in the task of looking for and finding known or expected fixed objects.

Baldwin, R. D. Aircraft recognition performance of crew chiefs with or without forward observers (HumRRO Tech. Rep. 70-12). Alexandria, VA: Human Resources Research Organization, August 1970. (NTIS No. AD-714 213)

Test of aircraft recognition accuracy and decision speed compared the performance of single observers and 4-man crews.

Baldwin, R. D. Attempts to improve visual detection through use of search patterns and optical aids (HumRRO Tech. Rep. 73-3). Alexandria, VA: Human Resources Research Organization, February 1973. (NTIS No. AD-758 056)

Compared the visual detection abilities of observers equipped with low- and moderate- powered optical systems, and compared the detection capabilities of observers using different techniques or strategies.

Barker, W. A. and Francis, K. R. Support of joint service test of Vinson (KY-57/58) secure voice equipment (C) (TAC-73L-075T). Eglin AFB, FL: Tactical Air Warfare Center, March 1976. (NTIS No. AD-C005 519L)

(U) Concluded that the operational performance of Vinson in a tactical environment is limited because of the transmission synchronization time delay between the Keying of the Microphone and the transmitting of the signal. Did not satisfactorily demonstrated the capibility to interface with all tactical air and ground elements.

Bartlett, C. J., Bobko, P., and Pine, S. M. Single-group validity: Fallacy of the facts? Journal of Applied Psychology, 1977, 62, 155-157.

Authors found where single-group validity is evident in a sample, further research is necessary in order to draw conclusions about the population.

Bartlett, N. R., Reed, J. D., and Dervaisin, G. Estimations of distance on polar coordinate plots as a function of the scale used. Journal of General Psychology, 1949, 41, 47-65.

Judgments of the relative distance of a mark on a map display were collected with subjects using different number scales. The researchers could perform reliable ranking of the overall accuracies with the three different scales, however, they also found that number effects play only a minor role in causing error.

Beebe-Center, J. G., Meed, L. C., Wagoner, K. S., and Hoffman, H. C. Visual acuity and distance of observation. Journal of Experimental Psychology, 1945, 35, 473-484.

Results show that visual acuity, defined in angular terms, may be considered to remain constant over the range of 30ft to 2 miles. Observed discrepancies from constancy were slight, relative to distances involved, and seemed explicable in terms of changes in contrast and illumination.

Bell Aerosystems Company. Artillery forward observer fire mission messages information theory (Bell Rep. No. A60009-622). Sierra Vista, AZ: Bell Aerosystems Company, Electronic Range Department, February 1965. (NTIS NO. AD-845 978)

An analysis of typical fire mission messages to define the information content of them in bit values which are then used to determine link quality necessary to accomplish information transfer.

Bem, D. J. and Allen, A. On predicting some of the people some of the time: The search for cross-situational consistencies in behavior. Psychological Review, 1974, 81, 506-520.

Author believes it is possible to identify on a priori grounds those individuals who will be cross-situationally consistent and those who will not, and it is concluded that not only must personality assessment attend to situations - as has been recently urged - but to persons as well.

Berry, G. A., Prather, D. C., and Bermudez, J. M. Differential effects of verbal mediation on learning and transfer of a complex perceptual skill. Perceptual and Motor Skills, 1974, 38, 1239-1242.

In a study of the effects of feedback on a size judgment task given to male undergraduates, it was found that verbalization caused a significant decrement in the transfer of training. This was discussed in terms of an age related trial and error learning skill.

Birnbaum, A. H., Rosenburg, N., White, R. K., and Willemin, L. P. Validation of potential combat predictors: ZI results for combat engineer (PRB Technical Note 79). Washington, D.C.:Personnel Research Branch, Adjutant General's Office, July 1957.

Validity coefficients for predictor ratings were substantially beyond those of any other single measure tried out, but it is not known to what extent these coefficients were influenced by rating bias factors.

Birnbaum, A. H., White, R. K., Rosenberg, N., and Willemin, L. P. Selection and standardization of tests and improved combat aptitude areas (TR Note 87). Washington, DC: Adjutant General's Office, Personnel Research Branch, December 1957.

Purpose of the study was to select potential new combat aptitude area composites on the basis of Korean combat, overseas maneuvers, and CONUS research information.

Birnbaum, A. H., White, R. K., Rosenberg, N., and Willemin, L. P. Validation of potential combat predictors: ZI results for armor (PRB Technical Research Note 78). Washington, D.C.: Personnel Research Branch, Adjutant General's Office, December 1957a.

Study goal was to improve effectiveness of aptitude area system of personnel classification and assignment for combat arms.

Bishop, H. P. Hardware parameters related to operator training capabilities (HumRRO Professional Paper 9-71). Alexandria, VA: Human Resources Research Organization, June 1971. (NTIS No. AD-727 657)

The research reported here is part of a larger effort to identify critical human factors problems in the use of new night observation devices and to develop effective techniques of training men in the use of these devices.

Bliss, W. D. A review of the literature on briefing and target acquisition performance (NWC-TP-5650). China Lake, CA: Naval Weapons Center, May 1974. (NTIS No. AD-920 257L)

The effect of perceptual factors on target acquisition process when prior knowledge of target exists.

Boehm, V. R. Differential prediction: A methodological artifact? Journal of Applied Psychology, 1977, 62, 146-154.

Instances of single-group validity appear to be related to the use of ratings rather than more objective measures such as criteria and to the use of small samples. Overall, author found very little evidence of differential validity.

Boehm, V. R. Negro-white differences in validity of employment and training selection procedures: Summary of research evidence. Journal of Applied Psychology, 1972, 56, 33-39.

Found a significant relationship exists between the validity outcome of the studies and the methodological practices score, i.e., for studies in which some validity was obtained those authors received significantly lower methodological practices score.

Bolles, R. C. and Bailey, D. E. Importance of object recognition in size constancy. Journal of Experimental Psychology, 1956, 51, 222-225.

The thesis of the paper is that in a familiar situation, subject uses sensory information (from the visual stimulus) to recognize and identify the "stimulus object" but that the information utilized in judging sizes does not come exclusively from the visual cues to size, but comes also from S's own past experience and learning. Two sets of judgments of size of a representative sample of familiar objects were obtained. Nonvisual estimates based only on verbal descriptions of the objects, and visual judgments of the same objects made under free, open-field conditions. Correlations of estimates of size with measured size approach unity, indicating nearly perfect size constancy for both kinds of judging conditions.

Bonder, S. and Farrell, R. (Eds.). Development of analytical models of battalion task force activities (Report No. SRL 1957-FR70-1). Ann Arbor, MI: Department of Industrial Engineering, University of Michigan, September 1970.

Computer simulation to predict the effectiveness of combat units equipped with mixes of weapon systems.

Boyd, E. H., Martin, J. F., Garrett, W. A., Starkey, J. E., and Moler, C. G. Independent evaluation report for development test II of the observed fire trainer (OFT) device 3E42 (Final Rept.). Aberdeen Proving Ground, MD: Army Test and Evaluation Command, December 1978 (NTIS No. AD-B032 386L).

The independent evaluation concluded that: (1) the OFT requires significant improvement in order to be able to fully meet the requirement documents; (2) the present design is not capable of fulfilling the mission of a portable training device; and (3) correction of sufficient problems to enable the OFT to serve as a training device for institutional use appears reasonable.

Brittain, C. V. and Hermansen, A. G. SQT implementation: Early results, early lessons. Symposium presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Examines early results in terms of their implications for individual training as well as with respect to lessons learned relevant to the testing of occupational competence.

Brown, F. L. Critical combat performances, knowledges, and skills required of the infantry rifle squad leaders (Research By-Product). Alexandria, VA: George Washington University, Human Resources Research Office, December 1968. (NTIS No. AD-713 846)

In response to a request from the United States Army Infantry School, HumRRO Division No. 4 (Infantry) initiated a Technical Advisory Service research project to identify and record the critical combat performances, knowledges, and skills required of the Infantry Rifle Squad Leader and the Infantry Fire Team Leader. This document details the requirements in the area of land navigation.

Brown, Lt. Col. F. L. Fundamentals of tracking. Infantry, 1966, 56, 28-33.

Focuses on the trail signs made by men as they move on foot over the face of the earth: displacement, staining, weathering, littering, camouflage, interpretation, and stealth. Suggests some training aids.

Brown, T. M., Buckly, H. L., Gibson, J. L., Burres, S. W., and McGarrahan, J. R. Forward observer team equipped with ground laser locator designator (FOTEGLLD) (MASSTER-TEST-FM-255). Fort Hood, TX: Modern Army Selected Systems Test Evaluation and Review, January 1975. (NTIS No. AD-B001 824L)

This report covers the field testing of the integration of ground laser locator designator equipped observation parties into the direct support field artillery battalion fire support system. The test assessed the several candidate parties, communications, and fire direction activities. Integration of the ground laser locator designator equipped forward observer parties into the present fire direction system, using the current communications systems, was demonstrated as feasible with a recommended four-man observation party.

Browne, M. W. A comparison of single sample and cross-validation methods for estimating the mean squared error of prediction in multiple linear regression. British Journal of Mathematical Statistical Psychology, 1975, 28, 112-120.

Two procedures for estimating the mean squared error of prediction of an empirically determined linear prediction equation are examined. The method usually employed makes use of a second validation sample; another method makes use of the calibration sample alone. The mean squared error of estimation is derived for each of the two estimation procedures and a comparison made. A test is provided also for the hypothesis that use of a prespecified subset of predictors results in no increase in the expected mean squared error of prediction.

Browne, M. W. Predictive validity of a linear regression equation. Brst is provided also for the hypothesis that use of a prespecified subset of predictors results in no increase in the expected mean squared error of prediction.

Browne, M. W. Predictive validity of a linear regression equation. British Journal of Mathematical Statistical Psychology, 1975, 28, 79-87.

The interaction of and R^2 in a multiple linear regression equation is discussed. Procedures for estimating the first and second moments of R^2 are presented.

Butler, F. C. Instruccional systems development for vocational and technical training. Englewood Cliffs, NJ: Educational Technology Publications, Inc., 1972.

The instructional systems development concept, process, and product are described in detail. The first five chapters contain a general discussion of the instructional systems development concept, the learning theory behind it, the elements of an instructional system, and the systems development process. The remaining chapters and the appendices provide detailed, how-to-do-it guides for the systems development process.

Campbell, J. T., Johnson, C. D., Browne, E., and Birnbaum, A. H. Procedural problems in validating the Army Classification Battery (PRB Technical Research Report 996). Washington, D.C.: Adjutant General's Office, Personnel Research Branch, December 1952.

A series of studies was initiated to check how well the various aptitude area scores do, in fact, predict success in various school courses. This study was an attempt to present solutions to procedural problems in the development of this research program.

Castleman, R. J., Jr. Artillery observer errors in flashing high burst registrations with the M2 airming circle. (Master's thesis). Monterey, CA: Naval Postgraduate School, June 1974. (NTIS No. AD-709 058)

Addresses the problem of determining the magnitude and direction of artillery observer errors in flashing high burst registrations with M2 aiming circle. It was found that larger errors were committed for measurements made in the vertical direction than for those in the horizontal direction. Most accurate measurements were made for flashes appearing in the first quadrant of the aiming circle reticle and for those appearing near the center of the reticle.

Caulfield, P. H. Test and evaluation of the Mark Systems Model 1610 Stabilized Binoculars (69-004). Bangkok, Thailand: OSD/ARPA Research and Development Center, May 1969. (NTIS No. AD-859 388)

Tested bioculars to see if they would be effective in reducing observed image motion when used from aircraft.

Caviness, J. A. and Maxey, J. L. Detection of human targets (TR-74-4). Research for the Department of the Army, February 1974. (NTIS No. AD-776 381)

A study of target detection times for human targets in various field situations was conducted to obtain data for the Army Small Arms Requirements Study (ASARS). Results indicate that terrain complexity and target range were positively related to detection time; target speed was negatively related. Examination of the 24 detection-time distributions suggests that the underlying probability distribution for the detection time distributions was not exponential in form.

Caviness, J. A., Maxey, J. L., and McPherson, J. H. Target detection and range estimation (HumRRO Tech. Rep. 72-34). Alexandria, VA: Human Resources Research Organization, November 1972. (NTIS No. AD-753 600)

Study of target detection times for human targets in field situations; terrain complexity and target range were positively related to detection time.

Chalmers, E. L., Jr. Monocular and binocular cues in the perception of size cued distance. American Journal of Psychology, 1952, 65, 415-423.

This investigation was designed to study and to control very carefully the primary and binocular areas which enter into the perception of size over distances of 100 ft. and more. Found that size-distance judgments were dependent upon the nature of the apparatus and the procedures, the attitude and degree of sophistication of the observer, and the extent to which secondary areas have been controlled or eliminated.

Chapanis, A. and Leyzorek, M. Accuracy of visual interpolation between scale markers as a function of the number assigned to the scale interval. Journal of Experimental Psychology, 1950, 40, 655-667.

Worst scale (2.5 miles) gave errors about twice as large as those obtained with best scale (10,000 yards).

Coleman, H. S. Literature survey of material published relating to specification of hand-held binoculars. In L. O. Harvey, Jr. (Ed.), Survey of visual research literature on military problems during World War II. Papers collected by the Armed Forces-NRC Vision Committee, April 1970.

Cotner, J. W. Simulation of position errors when using selected Army map products. (Master's thesis). Monterey, CA: Naval Postgraduate School, December 1977. (NTIS No. AD-A052 030)

A simulation approach is given to estimating the distribution of navigational errors observed during a test of four Army map products. Purpose of the field experiment was to determine the effectiveness of current and proposed maps. Parameters for the Gamma distribution were shown to provide the best estimation of errors.

Cronbach, L. J. and Gleser, G. C. Psychological tests and personnel decisions, 2nd ed. Urbana: University of Illinois Press, 1965.

This text of personnel testing focuses upon an application of decision theory to the development and application of tests. In addition to the basic text, several chapters by eminent statisticians are included.

Dawes, R. M. and Corrigan, B. Linear models in decision making. Psychological Bulletin, 1974, 81, 95-106.

Found all four experimental, random linear models yielded predictions that were superior to those of human judges. Might be helpful in developing task selection algorithms.

Deimel, R. W. and Blakelock, E. H. 1968 recruitment survey: Motivational factors influencing enlistment decision (WSR 69-5). Washington, DC: Naval Personnel Research and Development Laboratory, May 1969. (NTIS No. AD-853 810)

Personal reasons, of which "the opportunity to obtain technical training," the "desire to travel," and the "desire to serve the country" were important influences for about eight out of ten recruits.

Department of the Air Force. Handbook for designers of instructional systems, vol. I (AFP 50-58). Washington, DC: Department of the Air Force, Headquarters, January 1974.

Overviews the use of the handbook and the process of ISD, glossary included.

Department of the Air Force. Handbook for designers of instructional systems, vol. II (AFP 50-58). Washington, DC: Department of the Air Force, Headquarters, July 1973.

Presents methods and procedures for identifying job performance requirements and training requirements.

Department of the Air Force. Instructional system development (AF Manual 50-2). Washington, DC: Department of the Air Force, Headquarters, July 1975.

Manual describing a systematic procedure for assuring application of instructional technology to course planning and development.

Department of the Army. Field artillery cannon gunnery (FM 6-40). Washington, DC: Headquarters, Department of the Army, June 1974.

Department of the Army. Field artillery organizations (FM 6-140). Washington, DC: Department of the Army, Headquarters, April 1973.

Department of the Army. Field artillery target acquisition (FM 6-121). Washington, DC: Department of the Army, Headquarters, November 1967.

Department of the Army. Field artillery target acquisition: Battalion and batteries (FM 6-120). Washington, DC: Department of the Army, Headquarters, October 1967.

Department of the Army. Map reading (FM 21-26). Washington, DC: Department of the Army, Headquarters, January 1969.

Department of the Army. Modern battlefield cannon gunnery (FM 6-40-5). Washington, DC: Department of the Army, Headquarters, July 1976.

Dewald, L. S. Simulation of a field artillery battery in support of the defense. (Master's thesis). Monterey, CA: Naval Postgraduate School, June 1977. (NTIS No. AD-A042 290)

Simulates FO in target acquisition, calls for fire, and in adjustment of fire missions. Analysis and critique of system.

Director of Evaluation, U. S. Army Field Artillery School. Direct support unit forward observer training analysis for the Army training study (ACN 43022). Ft. Sill, OK: Author, September 1978.

This study looked at forward observer (FO) institutional and unit training, simulator effectiveness, the relationships of proficiency with various resources, and the relative effectiveness of individual and collective training.

Directorate of Training Development, the Directorate of Evaluation, and the Directorate of Course Development and Training, U. S. Army Field Artillery School. Army training study training effectiveness analysis 78: Forward observer/unit training (ACN 43022). Ft. Sill, OK: Author, October 1978.

This study was conducted to assess the relationship between forward observer proficiency in the delivery of fire tasks and Forward Observer training programs in the units.

Dobbins, D. A. et al. Jungle vision II: Effects of distance, horizontal placement, and site on personnel detection in an evergreen rainforest. Fort Clayton, Canal Zone: U.S. Army Tropic Test Center, March 1965.

Tested target detection capabilities in rainforest. Found 100 ft. to be near-limit of detectability. The greatest deterrents to vision appeared to be the extremely low levels of illumination, caused by the dense forest canopy, as well as the low-branching palms and the largeleafed herbaceous plants typical of the undergrowth of the evergreen rainfrost.

Domingue, J. C. The U.S. Army tactical fire direction system (TACFIRE) (AIAA Paper No. 73-418). Fort Belvoir, VA: U.S. Army Computer Systems Command, April 1973.

Describes a computer network to perform the functions of surface artillery fire control.

Draper, N. R., and Smith, H. Applied regression analysis. New York: Wiley, 1966.

Dyer, F. N. and Hilligos, R. E. Assessment center predictions of Army field leadership performance. Paper for the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Evaluation of USAIS ACTR for prediction of the field leadership performance of junior officers and NCO's.

Edgerton, H. A. and Graham, W. R. The identification of observable factors related to success in combat or simulated combat (PRS Rpt. 918). Washington, DC: Personnel Research Section Program, December 1951.

The purpose of this study is to identify factors which are related to success or failure of infantrymen in combat, and to establish hypotheses as to possible predictors of combat success. Used peer ratings and identified 50 statements as potentially predictive of better combat soldiers.

Edmonds, E. M. and Wright, R. H. The effects of map scale on position location (HumRRO Tech. Rep. 65-9). Fort Rucker, AL: Human Resources Research Organization, Division No. 6 (Aviation), September 1965. (NTIS No. AD-623 396)

1:25,000 scale map with certain format changes provides information necessary for enroute tactical navigation over moderate or long distances.

Egbert, R. L., Meeland, T., Cline, V. B., Forgy, E. W., Spickler, M. W., and Brown, C. Fighter I: An analysis of combat fighters and nonfighters (TR 44). Monterey, CA: U.S. Army Leadership Human Research Unit, December 1957.

This report reiterates the findings of the Egbert, Meeland, Cline, Forgy, Spickler, and Brown (1953) report on effective and ineffective combat performers.

Egbert, R. L., Meeland, T., Cline, V. B., Forgy, E. W., Spickler, M. W., and Brown, C. Fighter I: A study of effective and ineffective combat performers (Special Report 15). Monterey, CA: U.S. Army Leadership Human Research Unit, March 1953.

Found fighter tends to be more intelligent, more masculine, more socially mature, have greater emotional stability, and have better health than non-fighter.

Eschenbrenner, A. J., and Taylor, C. L. Forward air controller (FAC) visual training. Volume I: Analysis and specification of the essential elements of the FAC visual reconnaissance task (Report MDC E0043). St. Louis, MO: McDonnell Douglas Corporation, November 1969.

This report describes the work completed in the first phase of an Air Force funded study calling for the development and evaluation of a prototype program for training Forward Air Controllers (FACs) in the basic skills of detecting, recognizing, and identifying counterin surgency (COIN) targets. Analysis and specification of the essential elements of the FAC visual reconnaissance task comprised the major Phase I objective.

Findlay, D. C., Roach, E. G., and Cogan, E. A. Identification of the important skills in daylight land navigation (TR-40), July 1957.

Location test method offered some promise of giving instruction and practice in location skills, and of testing ability in land navigation.

Fishbein, M. and Aizen, I. Attitudes toward objects as predictors of single and multiple behavioral criteria. Psychological Review, 1974, 81, 59-74.

Traditional measures of attitudes towards an object are consistently related to multiple-act criteria. Application of standard attitude scaling procedures is viewed as a possible solution. Or alternatively, the construction of linearity and validity indexes.

Fischl, M. A. and Ross, R. M. Enhancing quality control in the testing of military applicants. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Describes the logic and evaluation of a highly cost-effective procedure for immediate verification of the veridicality of operational selection/classification test battery scores.

Flanagan, J. C. The critical incident technique. Psychological Bulletin, 1954, 51, 327-358.

This article describes the development of the critical incident technique which has been used successfully in analyzing combat leadership and disorientation in pilots.

Flaugher, R. L. The many definitions of test bias. American Psychologist, 1978, 33, 671-679.

The definition of test bias has many widely disparate aspects frequently stemming from entirely different universes of discourse. This article attempts a review of the status of each of these. It seems essential to keep all of these various aspects in mind, for we continually run the risk of losing perspective on our research when we settle on one operational definition of test bias and then proceed to forget that it is only that.

Follettie, J. F. A performance requirement for basic land navigation (HumRRO Tech. Rep. 4). Alexandria, VA: Human Resources Research Organization, March 1960.

Treats two fundamental problems of curriculum development: (1) establishment of critical characteristics of a job and (2) establishment of an appropriate framework for evaluating training.

Follettie, J. F. Development and evaluation of a program of instruction in basic land navigat.on (HumRRO Tech. Rep. 70). Alexandria, VA: Human Resources Research Organization, May 1961.

This report describes development and evaluation of a 12-hour Program of Instruction in basic land navigation for use in Army Basic Combat Training. Program was built around instruction in dead reckoning and map-terrain association.

Folley, J. D., Jr. Guidelines for task analysis (TR 1218-2). Valencia, PA: Applied Science Associates, Incorporation, June 1964.

Contains guidelines custom-built to fit into U.S. Naval Training Device Center's training situation analysis procedure for systematically generating training devices requirements to meet operational readiness needs.

Ford, J. P., Campbell, R. C., and Campbell, C. H. Training SQT developers Symposium at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Describes the development and implementation of a workshop for training SQT developers.

Freedman, A. Study of errors in range estimation with the unaided eye. Wright-Patterson AFB, OH: Foreign Technology Division, April 1945. (NTIS No. AD-658 582)

Purpose of study was to look at the accuracy of range estimation without aids among tank crew members. Recommend that the reasons for the apparent superiority in range estimation by some individuals be further investigated and that the influence of the character of the target be pointed out in imparting range estimation instruction to men.

Fried, C. and Ivey, L. F. A human engineering evaluation of spotting rounds with respect to fire direction capabilities (HEL TB-1100, TM 4-59). Aberdeen Proving Ground, MD: Human Engineering Laboratory, June 1959.

Subjects were required to make corrections in yards for azimuth and range from the position where the spotting round appeared to the actual target position. Concluded that as observation distance is increased, the size of both radial and range errors is increased.

Fruchter, B., Morin, R. E. and Archer, W. B. Efficiency of the open-ended inventory in eliciting task statements from job incumbents (Technical Documentary Report 63-8). Lackland AFB, TX: 6570th Personnel Research Laboratory, Aerospace Medical Division, March 1963.

Investigated methods of selecting incumbents and presenting the checklist to produce the most complete and accurate task inventory.

Fry, J. P. and Cliborn, R. E. Development, implementation, and evaluation of leadership/management training within army battalions. Volume I: Summary of findings (HumRRO FR-WD-TX-75-11-Vol-1). Alexandria, VA: Human Resources Research Organization, June 1975. (NTIS No. AD-A012 773)

Results consistent with previous research, attitudinal data was positive, but "hard" data, such as performance improvement was inconclusive.

Gagne, R. M. (Ed.) Psychological principles in system development. New York: Holt, Rinehart and Winston, 1962.

An integrated psychotechnology of system development.

Ghiselli, E. E. The prediction of predictability. Educational and Psychological Measurements, 1960, 20, 3-8.

An investigation into the problems of prediction. The results provide further confirmation of the fact that the exactness with which an individual's criterion score can be predicted from a test itself can be predicted.

Gibson, E. J. and Bergman, R. The effect of training on absolute estimation of distance over the ground. Journal of Experimental Psychology, 1954, 48, 473-483.

In a study designed to test whether training would result in improvement when the targets themselves provided no cues and when memorization of specific cues and yard numbers was not possible, it was found that improvement in absolute judgment of distance occurred as a result of training even though none of the distances presented for judgment were repeated.

Gibson, E. J. and Smith, J. The effect of training in distance estimation of the judgement of size-at-a-distance (RB 52-39). Lackland AFB, TX: Air Training Command, Human Resources Research Center, December 1952.

Found Subjects' estimation of distance of objects in a photographic situation was improved by the method of judgment followed by correction.

Gibson, J. J. and Flock, H. The apparent distance of mountains. American Journal of Psychology, 1962, 75, 501-503.

Suggests an explanation of why a distant summit can look nearer than it is: in level country, increasing terrestrial distance is correlated with the decreasing angular size of elements upward in the optical array since terrain features tend to have same size. When viewing a mountain, the distant earth shapes may be much larger than the nearer ones and the visual optical gradient will then be altered.

Gibson, J. L. Cooke, H. L., Battles, F. C., Barres, S. W., and Hopkins, F. E. Conceptual forward observer vehicle kit evaluation (TCATA-TEST-FM-329). Fort Hood, TX: TRADOC Combined Arms Test Activity, August 1976. (NTIS No. AD-B013 312L)

This report covers the field testing of the conceptual forward observer vehicle kit. The test was conducted in three phases to evaluate how each forward observer vehicle (FOV) affects overall mission performance of the forward observer parties. Conclusion is that in terms of overall distribution of patterns of pertinent fire mission data (i.e., range, azimuth, radial miss distances, and self-location errors), the testbed vehicle outperformed all other vehicles in fire mission accuracy.

Gilbert, A. C. F. Efficacy of certain measures in predicting Army officer performance. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

A number of cognitive and non-cognitive measures as well as ratings were obtained on all officers who attended OBC in the 13 major career branches during 1974 and an analysis was done to evaluate performance.

Gilbert, A. C. F. and Waldkoetter, R. O. Possible strategies for establishing training priorities. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Results of reanalyzing data by canonical correlation and factor analysis for establishing training priorites.

Gilbert, A. C. F., and Waldkoetter, R. O. Training priority and mode as related to task requirements criteria. Unpublished manuscript, 1978. (Available from Army Research Institute, Ft. Sill Field Unit, P.O. Box 3066, Ft. Sill, OK, 73503).

The utility of the four factor training priority model presented by Mead (1975) was evaluated in an Army Setting. Results of the regression analysis indicated that the four factors were effective in predicting frequency of judgments as to the appropriateness of the resident school training for the tasks.

Gilbert, A. C. F., Waldkoetter, R. O., and Castelnovo, A. E. Prediction of Field Artillery officer performance. Paper presented at the twentieth annual conference of the Military Testing Association, Oklahoma City, November 1978.

This paper reports on the findings of a study in which the objectives were to compare performance of Field Artillery officers on certain cognitive and noncognitive measures with

that of officers in the other Army career branches; to determine the effectiveness of these measures in predicting officer performance early in active tour duty; and to evaluate differences in performance among officers who pursued different fields of study while in college on the prediction and on the criterion measures.

Green, B. F. and Anderson, L. K. Speed and accuracy of reading polar coordinates on a horizontal plotting table. Journal of Applied Psychology, 1955, 39, 227.

Found that the accuracy of coordinate reading appears to depend more on the size of the interval between successive range and azimuth indications than on the form of these indications.

Green, B. F., Jr. In defense of measurement. American Psychologist, 1978, 33, 664-670.

Criticism of psychological tests is misplaced and ignores the major advantages of objective measurement. Professionally prepared multiple-choice tests are efficient yet searching. Tests achieve their power through aggregations and consequently indicate general tendencies, which are valid for aggregate behavioral tendencies. The apparent precision of numerical scores fosters an overdependence on test scores that must be resisted.

Grossman, J. D. and Whitehurst, R. O. Effect of visual acuity on target acquisition (NWC-TP-5884). China Lake, CA: Naval Weapons Center, June 1976. (NTIS No. AD-B012 482)

Effect of far visual acuity on target acquisition performance.

Gruber, H. E. Perceptions of size and distance. Unpublished doctoral dissertation, Cornell University, 1950.

Perceived space was analyzed in terms of perspective ratios expressing the relation between the visual angles subtended by objects and parts of their spatial contexts.

Gschwind, R. T. An evaluation of observer errors in spotting round fire control (TM 4-60). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory, March 1960.

Found distribution of range error when calling on target had an average deviation from the target of 7% of the range of the target.

Gschwind, R. T. and Horley, G. L. A preliminary human engineering evaluation of heavy mortar system performance (TM 3-62). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory, January 1962.

A field investigation was conducted to measure the terminal accuracy of the heavy mortar system with all aspects of field operation included. The mean number of rounds to achieve fire for effect was 5.3, with an associated average deviation from the target of 4.4 percent of the observer-target range.

Haggerty, H. R., Johnson, C. D., and King, S. H. Evaluation of mail-order ratings on combat performance of officers. Personel Psychology, 1959, 12, 597-605.

The analysis of the ratings collected by mail demonstrated that a satisfactory criterion could be obtained by such a procedure in a situation where the rating population consisted of competent and well-motivated officers. This paper reports the results of the study.

Harris, J. H., Osborn, W. C., and Boldovici, J. A. A paired-comparison approach for estimating task criticality. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio October 1977.

Discusses a paired-comparison technique for estimating the relative criticality of tasks and suggests how inter-rater reliability might be increased.

Hart, F. L. Study of task difficulty using field teams and the AFHRL benchmark scales. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Particular interest is focused on methods for organizing, training, and using small panels of expert observers to gather data.

Heilberg, E. The effects of partial target observation on artillery mission effectiveness (CORG-B-1650). Fort Belvoir, VA: Combat Operations Research Group, Technical Operations, August 1968.

Analyzes that component of target location error resulting from the observation and interpretation of a small number of discrete target elements. Results are applied in developing a Monte Carlo simulation.

Helme, W. H., Willemin, L. P., and Grafton, T. C. Prediction of officer behavior in a simulated combat situation (Research Report 1182). Arlington, VA: U.S. Army Research Institute for the Behavioral and Social Sciences, March 1974.

Two major dimensions of leadership--combat and technical/managerial -- were clearly differentiated in the range of

functional tasks constituting the simulated combat exercise. Officer characteristics as measured by the Differential Officer Battery were found to be differentially predictive of officer behavior in situations representative of the two major leadership dimensions.

Hilgendorf, R. L. Visual search and detection under simulated flare-light (AMRL-TR-68-112). Wright-Patterson Air Force Base, OH: Aerospace Medical Research Laboratory, December 1967.

Found target acquisition required average of 90 sec. under four simulated mark 24 flares dropped 0.25 mile apart and ignited at 2K feet, compared with average of 15 sec. under simulated sunlight.

Hilgendorf, R. L. and Simons, J. C. Flare range estimation: Evaluation of aids (TR 69-128). Wright-Patterson AFB, OH: Aerospace Medical Laboratory, Medical Division, February 1970. (NTIS No. AD-715 287)

Recommends the use of the Ritchie Ranger modified device that requires two flares dropped a known distance apart, but takes much time, discusses errors of naked eye also.

Hiller, J. H. A methodology for estimating the cost-effectiveness of alternative pretests. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Development of a methodology for measuring the cost-effectiveness of alternative pretesting procedures so that an optimal procedure may be selected.

Holway, A. H. and Boring, E. G. Determinants of apparent visuals with distance variants. American Journal of Psychology, 1941, 54, 21-37.

Distances measured varied from 10 to 120 ft. for conditions tested. The most probable form of the function relating apparent size to distance was found to be linear.

Horung, J. P. et al. Automated fire support artillery (AFSA) model (CORG-M-339). Alexandria, VA: Combat Operations Research Group, May 1968. (NTIS NO. AD-841 361).

This volume established the background for, and describes, an automated artillery assessment model developed in support of the SYNTAC war gaming analyses for the U.S. Army Combat Developments Command. Simulates various tactical operations.

Hoyt, W. G., Bennik, F. D., and Butler, A. K. The effectiveness of alternative media in conjunction with TEC for improving performance in MOS related tasks (TR-77-A20). Santa Monica, CA: System Development Corporation, December 1977. (NTIS No. AD-047 103).

This research report addresses two questions: Does CAI provide a suitable and acceptable media for delivering Training Extension Course (TEC) materials to field units? Can Army lesson developers feasibly be trained to convert self-paced, audio-visual materials into CAI format and easily update such materials? The results of this report suggest that: CAI can be cost effective; development and evaluation lead time can be short; Army lesson developers can be trained in a relatively brief period. The results also suggest potential training effectiveness as a result of individualized self-paced instruction inherent in the use of CAI and evaluation capabilities useful in the management of the instructional process.

Hughes, C. R. and Keiser, A. H. The search for an optimum forward observer (FO) - message-entry device (TM-19-77). Aberdeen Proving Ground, MD: U.S. Army Human Engineering Laboratory, May 1977.

Comparison between Fixed-Format-Message Entry Device (FFMED) and Magnavox Digital Message Device (DMD) found DMD reduced errors and increased performance of FO.

Human Resources Research Organization. Attitudes of youth toward military service: A comparison of results of national surveys conducted in May 1971 and November 1971 (DR-D7-72-16). Alexandria, VA: Author, April 1972. (NTIS No. AD-A015 577)

Results of surveys are presented regarding service preference; enlistment incentives; enlisted, officer, and Reserve or National Guard potential; and exposure to the military.

International Research Associates, Inc. A basic lesson plan for the teaching of map reading in the Marine Corps Reserve (ground) (TR-3). New York: Author, January 1957.

Found numerous opportunities for improvement of current reserve training in map reading.

International Research Associates, Inc. A set of objective tests of map reading ability for use in the Marine Corps Reserve (ground) (TR-2). New York: Author, January 1957.

Purpose of this report was to present a set of objective tests, consisting of a General Test and Sub-Area tests on the GMS Mapping and the Compass. Describes each of the tests and their development.

International Research Associates, Inc. A study of personal and military background factors related to map reading in the Marine Corps Reserve (ground) (TR-6). New York: Author, May 1957.

Intelligence was a strong determinant of map reading: it accounted for slightly more than 56% of the variation in marksmanship scores. None of the other characteristics (age, eduction, general proficiency, marksmanship and military rank) contributed more than 31% of the variance.

International Research Associates, Inc. Experiments on the use of the basic lesson plans for the teaching of map reading in the Marine Corps Reserve (ground) (TR-4). New York: Author, January 1957.

Purpose of the report was to present the Basic Lesson Plan which was constructed for teaching military symbols, grid coordinates, elevation and visibility.

Jackson, Lt. Col. D. K. The AFROTC weighted professional officer course selection system. Paper presented at the 19th annual conference of the Military Testing Association, San Antonio, October 1977.

Presents the rationale and historical background which formed the development of the weighted professional officer course selection system (WPSS).

Jacobs, T. O. A program of leadership instruction for junior officers (HumRRO Tech. Rep. 84). Alexandria, VA: Human Resources Research Organization, June 1963.

Practical exercises were used and were considered to be realistic and to reflect the kinds of problems junior officers will encounter. Instructional materials can be administered without special training for instructors.

Johnson, C. D., Burke, L. K., Loeffler, J. C., and Drucker, A. J. Prediction of the combat proficiency of infantrymen (PRB Technical Report 1093). Washington, DC: Adjutant General's Office, Personnel Research Branch, July 1955.

The most promising results have been with self-description measures of the personal traits and attitudes characteristic of the efficient combat man.

Johnson, C. D., Haggerty, H. R., King, S. H., and Klieger, W. A. Prediction of combat effectiveness of military academy graduates (PRB Tech. Research Note 32). Washington, D.C.: Adjutant General's Office, Department of the Army, November 1954.

Evaluated the ability of cadet measures to predict ratings of capability in leading military units in combat. Found

aptitude for Service Rating (from first year at academy) to be best single predictor (.50). Course grades were slightly related to combat criterion ratings.

Jones, F. E. A systematic analysis of army training requirements as the basis of more generalized training research (HumRRO Research Report 7). Alexandria, VA: Human Resources Research Organization, May 1961.

Explores ways and means of performing generalized training research, and development of a technology of training.

King, S. H., Campbell, J. L., Johnson, C. D., Kleiger, W. A., and Yaukey, D. W. Studies of the performance of officers in combat I. Relationship of West Point measures to later combat effectiveness (PRS Report 969). Washington, D.C.: Personnel Research Section, Personnel Research and Procedures Branch, Adjutant General's Office, Department of the Army, August 1952.

This study found that the aptitude for service Rating (for first class year) was consistently the best single predictor (.50) of the officer effectiveness of graduates of all classes.

King, S. H. Klieger, W. A., Campbell, J. T., Johnson, D. C., and Yaukey, D. W. Validation of personnel measures against combat performance of enlisted men in Korea: VI. Self-description items (PRB Technical Research Report 965). Washington, D.C.: Adjutant General's Office, Personnel Research Branch, July 1952.

Found their self-description items had no value in predicting combat performance.

Kinney, D. G. and Rindt, T. K. Analysis of laser designator coding requirements to avoid interference (C) (NWC-TP-5381). China Lake, CA: Naval Weapons Center, September 1972. (NTIS No. AD-522 318L)

(U) Some sort of laser coding is needed to prevent interference between the laser system of our own forces and to reduce interference.

Langer, J., Wapner, S., and Werner, H. The effect of danger upon the experience of time. American Journal of Psychology, 1961, 74, 94-97.

Time is overestimated during danger and the overestimation tends to increase as danger increases. Also found support for finding that danger changes the experience of distance.

Laveson, J. I. and DeVries, P. B. Forward air controller - Tactical air command pilot communication orientation (Final Technical Report MDC E0888). St. Louis, MO: McDonnell Douglas Corporation, August 1973.

Describes effects of standardized lexicon of terrain descriptors on time to locate terrain features.

Letchworth, G. A., Ragan, T. J., Stansell, V., and Huckabay, K. Evaluation of forward observers. Ft. Sill, OK: U.S. Army Field Artillery School, Department of Evaluation, September 1978.

Performance of forward observer students from the Army Field Artillery School at Fort Sill was investigated in relation to several learner variables. Learner variables included in the study were field dependence-independence cognitive style, visual haptic perceptual style, trait anxiety, scores on the Lorge-Thorndike I.Q. scale, and achievement scores (the Sequential Test of Educational Progress). These learner variables were investigated in relation to forward observers' performance as measured in three different testing situations throughout their training sequence. Results indicated that under certain circumstances, field dependence, anxiety, and I.Q. had an effect upon performance. Regression analysis indicated, however, that the learner variables were only accounting for 20 to 30 percent of the total variance. A learning task review indicated possible problems with present instructional procedures, and suggestions for more complete investigations into the instructional sequence were submitted.

Leyzorek, M. Accuracy of visual interpolation between circular scale markers as a function of the separation between markers. Journal of Experimental Psychology, 1949, 39, 270-279.

Of polar coordinate plot, it was found that errors of interpolation are large for scale intervals 1/8" and decrease rapidly as scale interval increases in size up to 1/2".

Long, G. E., and Varney, N. C. Automated pilot measurement system (AFHRL-TR-75-58). Lackland AFB, TX: Personnel Research Division, Air Force Human Resources Laboratory, September 1975. (NTIS No. AD-A018 151).

Under contract to AFHRL, a new approach to pilot selection, an automated pilot aptitude measurement system (APAMS) utilizing two GAT-Is, a Varian U20f minicomputer, and several audio and visual devices for presenting instruction and feedback, was deeloped and evaluated.

Louis, N.B. The effects of observer location and viewing method on target-detection with the 18-inch tank-mounted searchlight (HumRRo Tech. Rep. 91). Fort Knox, KY: U.S. Army Armor Human Research Unit, June 1964.

Designed to determine the effects on target detection of observer location and method of viewing in relation to several types of targets at selected distances.

Lyon, T. L. and Wiatrowski, W. A. An evaluation of the proposed laser operations for the human engineering laboratory range accuracy test (HELRAT) (USAE HA-42-090-75). Aberdeen Proving Ground, MD: Army Environmental Hygiene Agency, October 1974. (NTIS No. AD-B000 377L)

Makes recommendations to insure control measures for this field study.

Mahoney, B. and Fechter, A. E. Military compensation and the supply of career officers (Study S-292). Arlington, VA: Institute for Defense Analyses, 1968. (NTIS No. AD-822 534L)

Studies the influence of military and civilian earnings on the supply of military officers.

Marco, R. A., Bull, R. F., and Vidmar, R. L. Rotary wing proficiency - based aviator selection system (PASS) (Final Report). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences, March 1978.

The Proficiency-Based Aviator Selection System (PASS) is the result of an operational feasibility program developed by MDC to determine whether a learning sample approach could be used to select candidates for rotary wing aviator training. PASS was based on the Automated Pilot Aptitude Measurement System (APAMS), a five-hour learning sample of fixed wing piloting tasks, developed for the Air Force Pilot Selection Program.

McBride, J. R. An adaptive test of arithmetic reasoning. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

The reliability and validity of current paper tests can be achieved by adaptive tests half as long.

McClelland, D. C. Testing for competence rather than for "Intelligence." American Psychologist, 1973, 1-14.

Discusses the main lines of evidence for the validity of intelligence and aptitude tests and makes inferences from this review as to new lines that testing might take in the future.

McCluskey, M. R. Studies on reduced-scale ranging training with a simple range finder (HumRRO Tech. Rep. 71-24). Alexandria, VA: Human Resources Research Organization, December 1971. (NTIS No. AD-740 163)

Three experiments of reduced scale stadimetric ranging training were conducted for a criterion range of 1500 meters trained with stadimetric or occlusion ranging aids. The results indicated that the type of feedback given during training does not affect ranging performance, the reduced-scale training appears to be valid for the incoming direction of flight but not for the outgoing, and the ranging skill acquired during training did not transfer completely to the full-scale environment.

McCluskey, M. R., Wright, A. D., and Frederickson, E. W. Studies on training ground observers to estimate range to aerial targets (HumRRO Tech. Rep. 68-5). Alexandria, VA: Human Resources Research Organization, May 1968. (NTIS No. AD-669 963)

Studied several methods of range estimation training methods and found performance was influenced by aircraft elevation and direction of flight.

McGuigan, T. J. An investigation of several methods of teaching contour interpretation. Journal of Applied Psychology, 1957, 41, 5[illegible]7.

The results showed that the training method involving representation of terrain by two-dimensional slides, and presenting the symbol on a three-dimensional map, generally led to highest proficiency.

McGuigan, T. J. and Grubb, J. W. Several methods of teaching contour interpretation (HumRRO Tech. Rep. 35). Washington, DC: Human Resources Research Office, George Washington University, January 1957.

Three ways of representing terrain (terrain board, 3-D slides, and 2-D slides) and two ways of representing contours (standard flat relief map and 3-D relief map) were tested for effectiveness in teaching a map user how to visualize terrain features. The experimental training method which consistently led to the greatest proficiency combined use of 2-D slides and 3-D relief maps.

Mead, Lt. Col. D. T. Determining training priorities for job tasks. Paper presented at the 17tn meeting of the Military Testing Association, September 1975.

Describes the effort to develop a single universal training priority equation.

Meeland, T. and Egbert, R. L. Dimensions of stress performance in field and laboratory situations. Paper presented at the meeting of the American Psychological Association, Chicago, July 1956.

This report concerned the factorization of 50 widely differing stress performance variables.

Meredith, J. B., Jr. and Dion, R. J. Utilization of hierarchical proficiency levels for a criterion-referenced training system assessment. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

This method offers an efficient method for assessing the effectiveness of a training system.

Military Assistance Command. Vietnam lessons learned number 77: Fire support coordination in the Republic of Vietnam (C) (MALJ3-052). San Francisco: Military Assistance Command Vietnam APO, May 1970. (NTIS No. AD-509 994)

(U) Describes the coordination of simultaneous sources of fire support means on one target. Discusses Field Artillery Support, Armed Helicopter Support, Tactical Air Support, and Naval Gunfire Support.

Milligan, J. R., and Waldkoetter, R. O. Observer self-location ability and its relationship to cognitive orientation skills. Paper presented at the twentieth annual conference of the Military Testing Association, Oklahoma City, November 1978.

This paper presents the results of a study that examined the relationships among self-location abilities and performance on an orientation task requiring estimates of compass directions and geographical spatial orientation using visual imagery.

Mirabella, A. Criterion-referenced systems approaches to evaluation of combat units. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Describes how various parts of the research program are beginning to converge into a set of coherent, applicable evaluation concepts and methods.

Nelson, A. E., Marco, R. A., and Banks, A. L. Character profile of the West Virginia Coal Mines: Analysis of demographic, personal, attitudinal, and academic achievement data. In a training analysis approach to the education of coal miners (Appendix C, MDC E1566). St. Louis, MO: McDonnell Douglas Corporation, August 1976.

A character profile of the West Virginia coal miner was obtained for use in developing materials for a training program in miner health and safety. The profile consisted of personal, social, and

educational data, attitudes toward instructional techniques, alienation attitudes toward mining health and safety and the mining situation, impulsivity, and internal-external locus of control.

Neuheuser, H. The future armored artillery observation vehicle of the Bundeswehr (W. German Army) (FSTC-HT-23-359-75). Charlottesville, VA: Army Foreign Science and Technology Center, January 1975.

Concludes that artillery fire preparation is reduced to 1-3 mins from 15-20 mins and overall combat effectiveness is improved by use of forward observer vehicle.

Nichols, R. L., Saeger, A. R. Jr., Driessnack, H. H., House, L., and Reid, R. G. The officer corps in an all-volunteer force: Will college men serve? Naval War College Review, 1971, 23, 31-50.

Concludes that without the draft it will not be feasible to obtain a sufficient supply of qualified officers to maintain a 2.5 million manforce.

Olson, W. K. A terrain analysis of four tactical situations (AMS AA-TT-158). Aberdeen Proving Ground, MD: U.S. Army Material Systems Analysis Agency, December 1972. (NTIS No. AD-909 634)

Four digitized topographic regions are used to determine the distributions of attacker visible path segment length, weapon-target opening range, and line-of-sight probability from a vantage point. The data are used to develop probability information concerning moving target duration time. Conclusions are drawn concerning the ability of a defender to engage on advancing target within certain time constraints.

Orlich, D. C. Designing sensible surveys. Pleasantville, New York: Redgrave Publishing Company, 1978.

Pepper, D. and Scanland, W. Measurement of learned behaviors in competency based leadership training programs. Paper presented at the 19th annual conference of the Military Testing Association, San Antonio, October 1977.

Describes the use of "criterion sampling" for the measurement of competency in anything.

Pine, S. M. Reducing test bias by adaptive testing. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

How selection fairness is influenced by the item characteristics of a selection instrument in terms of its distribution of item difficulties, level of item discrimination, and degree of item bias.

Powers, T. R. Advanced land navigation: Development and evaluation of a prototype program of instruction (TR 89). Fort Benning, GA: U.S. Army Infantry Human Research Unit, April 1964.

Describes how research was conducted to determine the land navigational performance required of infantrymen who have completed AIT (advanced individual training) and the design of a program of instruction that would develop the level of skill defined by that performance requirement. Found that the 10-hour prototype program of instruction in advanced land navigation can be used to train enlisted men to navigate accurately over difficult, unfamiliar terrain under all conditions of visibility.

Prather, D. C. The efficiency of trial-and-error versus errorless learning of a perceptual-motor skill and performance under transfer and stress. American Journal of Psychology, 1971, 84, 377-386.

Ninety-six student pilots were trained on a range-estimation task, either by a trial-and-error method or by an errorless method. After eight training trials, performance under the two methods was statistically equal. In subsequent performance, the trial-and-error subjects were superior on transfer ($P < .05$) and under stress ($p < .01$). Under a combination of transfer and stress, there was no significant difference between the two groups.

Project Team I, U.S. Army Combat Developments Experimentation Command and Braddock, Dunn, and McDonald Scientific Support Laboratory. Test of new and improved maps and map products, final report (FC 015). Fort Monroe, VA: TRADOC, October 1974. (NTIS No. AD-923 471L)

MAPPRO II evaluated the utility of six selected map products when used at night by artillery forward observers and infantry platoon leaders for cross country navigation and self and point location, and by artillery battalion survey party chiefs for locating survey control points. Player performance indicated no significant differences in the utility of any particular map.

Pryplesh, S. J. An analysis of field artillery unit configurations employing cannon launched guided projectiles. (Master's thesis). Monterey, CA: Naval Postgraduate School, September 1975. (NTIS No. AD-B008 597)

Evaluation of variations in artillery unit configurations, includes number of FO's, number of howitzers and battalions, and changes in unit response time for fire missions.

Pulliam, R. State of the art in job task analysis. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Summary of the history of the scientific study of work.

Rampton, Lt. Col. G., M. A strategy for task analysis and criterion definition based on multidimensional scaling. Paper presented at the Twentieth annual conference of the Military Testing Association, Oklahoma City, November 1978.

This paper describes the development of research strategy using nonmetric multi-dimensional scaling and its application on the Air Observer job in the Canadian Forces.

Ree, M. J. Development of the Armed Services Vocational Aptitude Battery. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Discusses the logic of the construction of this multiple aptitude battery and the rationale for the development of scales and subtests.

Reid, A. H. (Ed.). Initial study on the utility of ground-based laser designators in a combat environment (C) (Tech. Memo No. 132). Aberdeen Proving Ground, MD: U.S. Army Materiel Systems Analysis Agency, July 1972.

(U) A tactical terrain analysis indicates how often opportunities to employ ground-based laser designators may occur, and the effects of degraded atmosphere are examined.

Reid, A. H. et al. Interim report on the utility of ground-based laser designators (AMSAA Interim Note CSD No. 6). Aberdeen Proving Ground, MD: Army Materiel Systems Analysis Agency, January 1972.

Two defensive tactical situations are developed and laser designators are deployed at typical FO positions.

Roberts, W. K. Implementing instructional technology in Army training: Some obstacles and solutions. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

An historical perspective for many Army training programs today and of the training support it took to get there.

Rosenquist, H. S. Capabilities and limitations of the lensatic compass (Research Memorandum). Alexandria, VA: Human Resources Research Office, George Washington University, October 1959. (NTIS No. AD-488 023L)

Rosenquist, H. S. and Taylor, J. E. Improving the ability of the individual soldier to employ a map and compass in land navigation (Staff Memo). Alexandria, VA: Human Resources Research Organization, George Washington University, January 1957. (NTIS No. AD-488 024)

Two training programs were compared and evaluated.

Salisbury, J. D. Test result of the georgraphic position locator - A system for improving land navigation without external aids (CONF-721005-1). Livermore, CA: California University, Lawrence Livermore Laboratory, July 1972.

Geographic Position Locator (GPL) offered a major opportunity for navigator performance improvement.

Severin, D. G., Campbell, J. T., Johnson, C. D., and Yaukey, D. W. Measure of combat performance in Korea: I. Criterion measures for enlisted men (PRB Technical Research Report 938). Washington, DC: Adjutant General's Office, Personnel Research Branch, April 1952.

Recommends the use of ratings on overall performance and aggressiveness as criterion measures.

Sharp, L. H., Campbell, J. T., Johnson, C. D., and Yaukey, D. W. Validation of personnel measures against combat performance of enlisted men in Korea. II. Army Classification Battery and related variables (PRB Technical Research Report 940). Washington, D.C.: Adjutant General's Office, Personnel Research Branch, April 1952.

ACB tests in general showed some agreement with combat ratings.

Sharp, L. H., Gordon, D., and Reuder, M. Review of studies on the effects of training night vision ability (PRS Report 974). Washington, DC: Personnel Research Section, August 1952.

Objective was to ascertain whether testing, training, or both are required to obtain a group of individuals with good night vision.

Shirom, A. On some correlates of combat performance. Administrative Science Quarterly, 1976, 21, 419-432.

Several hypothesized correlates of combat performance were tested. Used peer ratings and a questionnaire. The hypotheses that combat performance was associated with favorable evaluations of one's commanders and the social integration of one's unit were supported by the data. Social support provided by a soldier to others in the units was found to be highly related to his combat performance. The results suggest that, in a combat unit, characteristics of the

interpersonal relationships might be the most powerful predictors of individual soldiers' combat performance in future studies.

Shriver, E. L. Guidance for performance of the behavioral task analysis (AFHRL paper). Wright-Patterson AFB, OH: Air Force Human Resources Laboratory, Matrix Systems Research Division, URS Systems Corporation, September 1971.

Identifies tasks which require a behavioral task analysis and provides manager with summary information on the gross tasks.

Smith, B. J. Task analysis methods compared for application to training equipment development (TR 1218-5). Valencia, PA: Applied Science Associates, Incorporated, September 1965.

Personnel aspects of modern military systems under development include criteria for selection, for technical manuals, and for training and training equipment, at the least.

Solomon, H. (Ed.). Studies in item analysis and prediction. Stanford: Stanford University Press, 1961.

Staff, Task PATROL. Basic instruction in land navigation, proficiency test manual (Research Memo). Fort Benning, GA: U.S. Army Infantry Human Research Unit, December 1958. (NTIS No. AD-488 021L)

This Research Memorandun presents the test which was developed to evaluate the adequacy of the training outlined in PATROL I: Land Navigation, Instructor's Guide, May 1958.

Stanley, J. C. Predicting college success of the educationally disadvantaged. Science, 1971, 171, 640-647.

Redefines the term, "educationally disadvantaged" and suggests the use of specialized curricula for the "disadvantaged."

Stark, E. A., Wolff, P. C., and Haggard, D. F. A preliminary investigation of the trainability of target detection and distance estimation skills (Research Memo). Fort Knox, KY: U.S. Army Armor Human Research Unit, July 1961.

The results of this study indicate that the training methods employed produced improvements in performance in both target detection and distance estimation.

Swanson, L. Validation of the Armed Services Vocational Aptitude Battery (ASVAB) in Navy technical schools. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Description of concurrent and predictive validation studies.

Tallarico, R. B. and Polk, B. E. Training basic combat soldiers in the critical skills of map using (Staff Memo). Alexandria, VA: Human Resources Research Organization, George Washington University, April 1955. (NTIS No. AD-480 550L)

The study determined that the experimental method took less time and produced the same degree of map reading proficiency.

Tallarico, R. B., Montague, W. E., and Denenberg, V. H. The map-using proficiency of basic trainees (TR-11). Fort Knox, KY: Human Research Unit No. 1, OCAFF, September 1954.

Objectives of the study include determining how well basic trainees, taking the standard Army map training course, learn to read maps and to utilize a contour map and compass in the field. Additionally, to determine whether field map proficiency of basic soldiers could be raised by training from a specially devised lesson plan. Results indicate that successful performance on map tests depends to a considerable degree upon general intelligence.

Taylor, C. L. and Eschenbrenner, A. J. Forward air controller visual reconnaissance training manual. St. Louis, MO: McDonnell Douglas Corporation, February 1970.

Training manual developed for the training of forward air controllers. This manual is composed mostly of pictorial materials which when used increased training efficiency of complex concepts. The use of verbal materials was held to a minimum.

Taylor, C. L., Eschenbrenner, A. J., and Valverde, H. H. Development and evaluation of a Forward Air Controller (FAC) visual training program (TR AFAL-TR-70-190). Wright-Patterson AFB, OH: Air Force Avionics Laboratory, Air Force Systems Command, September 1970.

This report describes the development and evaluation of a prototype program for training forward air controllers in the basic skills of detecting, recognizing, and identifying limited war/counterinsurgency (LW/COIN) targets. The prototype training program was compared with the conventional training program within the context of a two-group experiment and recommendations were made for incorporating the prototype training program into the present training curriculum.

Taylor, J. E. Identification of stationary human targets (Research Memo). Fort Benning, GA: U.S. Army Infantry Human Research Unit, December 1960. (NTIS No. AD-627 217)

Studies were conducted to determine low visibility identification curves for human targets as a function of level of illumination, position of target, position of observer, and night vision training of observer.

Teichner, W. H., Kobrick, J. C., and Wehrkamp, K. F. The effects of terrain and observation distance on relative depth discrimination. American Journal of Psychology, 1955, 68, 193-208.

Subjects made equality judgments of the relative spatial positioning of two large targets when the targets were at different observation distances and on different types of terrain surfaces. Analysis of the results showed that the linear threshold of equality increased exponentially with viewing distance for both monocular and binocular viewing. The linear threshold was also found to vary slightly among terrains used.

Teichner, W. H., and Mocharnuk, J. B. Visual search for complex targets. Human Factors, 1979, 21, in press.

With the use of available data, search time and stimulus processing rate for a multidimensional target in an array of such stimuli were analyzed with respect to a number of displayed stimuli and total stimulus information. The major findings were that search time decreases and stimulus processing rate increases as the number of dimensions in a multidimensional target increases and that the rate of processing increases as a function of total stimulus information. A model of total stimulus information which assumes sequential processing of dimensions in order of increasing features or levels was found to fit the data.

Thomas, A. S. Ground observer target acquisition capability: Analysis and interpretation of data from two field experiments (AMS AA-TR-125). Aberdeen Proving Ground, MD: U.S. Army Materiel Systems Analysis Activity, June 1976.

Ground observer target acquisition data from two field experiments conducted by Combat Development Experimental Command are presented and compared. Traditional physical target acquisition models are used to explain apparent disparaties between the data in the two experiments. Range dependent day/night acquisition capabilities based on the experiment for a hypothetical mid-intensity combat scenario in the FULDA area of Germany constitute the principal results of this report. In addition, methodologies are suggested for transforming laboratory derived acquisition data into similar tactical contexts.

Tiemann, R. S., Campbell, J. T., Goldstein, L. G., Johnson, C. D., and Yaukey, D. W. Validation of personnel measures against combat performance measures against combat performance of enlisted men in Korea. IV. Experimental aptitude tests (PRS Report 948). Washington, D.C.: Adjutant General's Office, Personnel Research Branch, May 1952.

Some agreement was found between scores on the experimental aptitude tests and the combat ratings.

Tupes, E. C. and Madden, H. L. Prediction of officer performance and retention from selected characteristics of the college attended (AFHRL-TR-68-119). Lackland, AFB, TX: AFHRL, Personnel Research Division, December 1968. (NTIS No. AD-688 540)

Analyses indicate that differences between AFROTC detachments are primarily due to differences in student bodies of the colleges.

USAF School of Applied Aerospace Sciences. Instructional system materials development (3AIR 75160). Lackland AFB, TX: Department of Recruiting and Instructor Training, USAF School of Applied Aerospace Sciences, July 1975.

This report is a handbook for Air Force personnel who develop instructional systems.

U.S. Army. The field artillery observer (FM 6-30). Washington, D.C.: Headquarters, Department of the Army, August 1978.

U.S. Army. Lessons Learned, Artillery Reports - 8th BN, 4th Arty; 7th Bn, 8th Field Arty; 52nd Arty Gp, and 108th Arty Gp (C) (Report No. DAFD-OTT 711075). Washington, DC: Adjutant General's Office, Department of the Army, November 1971. (NTIS No. AD-517 979)

(U) Provides information taken from combat operations in Viet Nam that are to be used to the benefit of future operations and may be adopted for use in developing training material. Makes recommendations about the employment of heavy artillery, use of communications, and material modifications.

U.S. Army. Lessons Learned, Headquarters, 54th Artillery Group (C). Washington, DC: Adjutant General's Office, Department of the Army, November 1966. (NTIS No. AD-389 452)

(U) Describes the actions of the 54th Artillery Group in Viet Nam. Describes commmander's observations and recommendations based on experience in the areas of communications, visual reconnaissance and logistics.

U.S. Army. Lessons Learned, Headquarters 3D Howitzer Battalion, 6th Artillery (C). Washington, DC: Adjutant General's Office, Department of the Army, November 1966. (NTIS No. AD-389 437)

(U) Describes the actions of the 3rd Howitzer Battalion in Viet Nam and also the commander's observations and recommendations of the use of forward observers, firing charts, and special equipment used.

U.S. Army Combat Developments Command Experimentation Command. Ability to adjust artillery on moving material targets, final report (USACDCEC Experiment 32.1). Fort Ord, CA: U.S. Army Combat Developments Command Experimentation Command, May 1970. (NTIS No. AD-869 451)

This experiment was conducted in three Phases: Phase I, Adjustment of Subsequent Rounds, measured aspects of the ability of a forward observer to engage an initially stationary target that has taken evasive action. Phase II, Initial Call for Fire and Adjustment of Subsequent Rounds, measured aspects of the ability of an FO to engage a moving target with initial and subsequent rounds. Phase III, Accuracy of Moving Target Estimation, examined the ability of an FO to predict the time that a target vehicle would reach a preplanned target.

U. S. Army Combat Developments Command Experimentation Command. Artillery versus moving target follow-on (REACT) (USACDCEC Exp. 32.2). Ft. Ord, CA: U.S. Army Combat Developments Command Experimentation Command, July 1971.

Evaluation of FO's ability to engage moving material targets and to adjust artillery volleys on the same targets.

U.S. Army Combat Developments Command Experimentation Command. Ground observer probabilities of acquisition/adjustment (USACDCEC Exp. 31.1, Vol. 1). Fort Ord, CA: U.S. Army Combat Developments Command Experimentation Command, September 1968. (NTIS No. AD-841 633)

This experiment evaluated the performance of artillery and mortar ground observers in target acquisition and in adjustment of artillery and mortar fire on acquired targets. Phase I, Acquisition, examined the effects of four experimentation factors--light level, target type, observer vision aid, and observer environment--on the measures of acquisition performance--probability of detection, time of acquisition, adequacy of target identification, and accuracy of target location. Phase II, Adjustment, examined the effects of the four Phase I experimentation factors and one additional factor, weapon type, on the measures of adjustment performance--probability of successful adjustment number of rounds to adjust, and time to adjust. Sixty observers in a defensive situation participated in approximately 15,000 individual observer acquisition opportunities, and over 1800 individual observer adjustment opportunities. From these opportunities, data were developed on observer acquisition and adjustment probabilities under the various experimentation conditions. Additionally, a series of related investigations and analyses were conducted to examine other aspects of observer performance and to evaluate the operational use of the passive night vision device and the laser rangefinder. The data from the experiment were subjected to a covariate analysis from which measures of observer performances were derived.

U.S. Army Combat Developments Command Experimentation Command. Ground observer probabilities of acquisition/adjustment (USACDCEC Exp. 31.1, Vol. 2). Fort Ord, CA: U.S. Army Combat Developments Command Experimentation Command, September 1968. (NTIS No. AD-841 631)

Analysis of covariance tables and tables of response variate means.

U.S. Army Combat Developments Command Experimentation Command and BDM Scientific Support Laboratory. Test of new and improved maps and map products (phase III), final report (FC 016). Fort Monroe, VA: HQ, TRADOC, August 1977. (NTIS No. AD-B021 171L)

Evaluation of four types of map products for day and night navigation and target location. Test personnel were officer's and NCO's.

U.S. Army Field Artillery School. Adjustment of fire, reference note (RN GO-AK, SEP 74). Fort Sill, OK: Gunnery Department, February 1976.

U.S. Army Field Artillery School. Adjustment of mortars, handout (GD-D1 HO 2). Fort Sill, OK: Gunnery Department, January 1978.

U.S. Army Field Artillery School. Cannon launched guided projectile cost and operational effectiveness analysis (ACN 18812). Fort Sill, OK: Author, March 1975.

The purpose of the study was to determine whether or not CLGP (Cannon Launched Guided Projectile) provides the Army with a cost and operationally effective means of defeating moving and stationary hardpoint targets when compared to other point weapon systems.

U.S. Army Field Artillery School. Course of instruction for 2-6-C20, Field artillery officer basic course SS1:13E (COI 2-6-C20). Fort Sill, OK: Author, June 1977.

U.S. Army Field Artillery School. Course of instruction for 250-13F10, Field artillery fire support specialist course. Fort Sill, OK: Author, March 1978.

U.S. Army Field Artillery School. Field artillery cannon gunnery, vol. 1 (FM 6-30). Fort Sill, OK: Author, October 1977.

U.S. Army Field Artillery School. Field artillery counterfire: How to attack enemy cannon, mortar, and rockets (TC 6-20-4). Fort Sill, OK: Author, September 1975.

U.S. Army Field Artillery School. Field artillery lieutenants manual. Fort Sill, OK: Author, July 1977.

U.S. Army Field Artillery School. Field artillery reference data (FAS Rpt. 70D01). Fort Sill, OK: Author, April 1970.

U.S. Army Field Artillery School. Field artillery target acquisition, reference note (AT 1000). Fort Sill, OK: Author, Counterfire Department, June 1976.

U.S. Army Field Artillery School. Final protective fires, handout (GD-DI HO 1). Fort Sill, OK: Gunnery Department, January 1978.

U.S. Army Field Artillery School. Fire for effect: How to be your own forward observer (TC 6-40-4). Fort Sill, OK: Author, February 1978.

U.S. Army Field Artillery School. The fire support team (TC 6-20-10). Fort Sill, OK: Tactics and Combined Arms Department, October 1978.

U.S. Army Field Artillery School. The forward observer, reference note (RN GO-AC, NOV 76). Fort Sill, OK: Gunnery Department, November 1976.

U.S. Army Field Artillery School. 14.5-mm field artillery trainer M31, reference note (RN GOF702, OCT 72). Fort Sill, OK: Gunnery Department, February 1975.

U.S. Army Field Artillery School. Map reading: Altitude and relief (PT2 E061AS24A, 04106AS24A. Fort Sill, OK: Counterfire Department, January 1977.

U.S. Army Field Artillery School. Map reading: Definition, classification, marginal information, topographic symbols (PT2 E061AS21A, 041061AS21A). Fort Sill, OK: Counterfire Department, January 1977.

U.S. Army Field Artillery School. Map reading: Direction (PT2 E061AS23A, 04106AS23A). Fort Sill, OK: Counterfire Department, January 1977.

U.S. Army Field Artillery School. Map reading: Location (PT2 E061AS22A, 041061AS22A). Fort Sill, OK: Counterfire Department, January 1977.

U.S. Army Field Artillery School. Night observation device, medium range, handout (HO-GO--AT, SEP 1975). Fort Sill, OK: Gunnery Department, September 1975.

U.S. Army Field Artillery School. Observed fire target location (shift from a known point) programmed text (study guide) (PT061G001A). Fort Sill, OK: Gunnery Department, March 1977.

U.S. Army Field Artillery School. Observed fire, workbook (OF WB 1, sec I). Fort Sill, OK: Gunnery Department, January 1976.

U.S. Army Field Artillery School. *Prepare and transmit message to observer, study guide* (13E-1255 SG). Fort Sill, Ok: Gunnery Department, March 1978.

U.S. Army Field Artillery School. *Shell fuze combination and visual effects, study guide* (13E-1255 SG). Fort Sill, OK: Gunnery Department, December 1977.

U.S. Army Field Artillery School. *Soldier's manual MOS 13F, fire support specialist skill level 1/2* (FM 6-13F 1/2). Fort Sill, OK: Author, June 1977.

U.S. Army Field Artillery School. *Soldier's manual 13F fire support specialist - skill level 1 and 2* (FM 6-13F 1/2). Fort Sill, OK: Author, July 1976.

U.S. Army Field Artillery School. *Special missions - Fire direction and forward observer procedures, reference note* (RN 6D--DI, Jul 77). Ft. Sill, OK: Gannery Department, July 1977.

U.S. Army Field Artillery School. *Weapon system training analysis - The forward observer, phase 1A, baseline* (Vol. 1, ACN 32750). Fort Sill, OK: Author, May 1977.

A TRADOC program designed to assess the effectiveness of the Forward Observer Subsystem. Objectives are to establish an institutional and a non-institutional FO performance level against which to compare subsequent training modifications.

U.S. Army Field Artillery School. *Weapon system training effectiveness analysis - The forward observer, phase 1A* (Vol. 2, support package, ACN 32750). Fort Sill, OK: Author, May 1977.

The support package to the Weapons System Training Effectiveness Analysis (WSTEA) study of Forward Observers. Contains data and its analysis.

U.S. Army Field Artillery School. *Weapon system training effectiveness analysis - the forward observer, phase II* (ACN 32750). Ft. Sill, OK: U. S. Army Field Artillery School, November 1978.

Study to assess the forward observer's capability to locate targets and himself accurately. This report summarizes the effectiveness of an alternate training method which is described within the report.

U.S. Army Infantry Human Research Unit. *Instructor's guide. Advanced land navigation: A prototype course* (TR-29). Fort Benning, GA: Author, July 1963.

A complete description of and instructions for implementing the Advanced Land Navigation Program for infantrymen.

U.S. Army Infantry Human Research Unit. Instructor's guide. Patrol I. Land navigation: Basic instruction (Research Memorandum). Fort Benning, GA: Author, December 1958. (NTIS No. AD-488 401)

This Research Memorandum represents an experimental program of basic instruction in land navigation under day and night visibility conditions. The program stresses the acquisition of a degree of skill appropriate to the Basic Individual Combat Training Level. The report contains three enclosures: An Instructor's Guide, an Addendum; and a Film Slide Supplement.

U.S. Army Topographic Command. Specifications for military maps (Technical Manual S-1). Author, March 1969, Ch. 5-6.

Provides basic specifications for the field classification survey for standard large and medium scale mapping projects and for the compilation and symbolization of roads, railroads, and related features on large scale topographic maps.

U.S. Training and Doctrine Command. Interservice procedures for instructional systems development, executive summary and model (TRADOC Pamphlet 350-30). Fort Monroe, VA: Author, Headquarters, August 1975.

Valentine, L. D. Assessments of the Armed Services Vocational Aptitude Battery (ASVAB) validity. Paper presented at the 19th annual meeting of the Military Testing Association, San Antonio, October 1977.

Found that both educational background data and test data make significant, unique contributions to prediction within the context of each other.

Vanderplas, J. M. Transfer of training and its relation to perceptual learning and recognition. Psychological Review, 1958, 65, 375-385.

This paper brings together several current concepts arising from the study of transfer of training and to consider their implications for the study of perceptual learning and recognition.

Waller, E. A. Young men and military service: Condensation of volume V, Youth in transition (AFHRL TR 73-70). Brooks Air Force Base, TX: Air Force Human Resources Laboratory, January 1974. (NTIS No. AD-777 913)

Study to discover what factors influence young men to enlist in the military service as opposed to taking jobs or continuing school. Found no single military type.

Waller, T. G. and Wright, R. H. The effect of training on accuracy of angle estimation (HumRRO Tech. Rep. 65-8). Fort Rucker, AL: Human Resources Research Office, Division No. 6 (Aviation), August 1965. (NTIS No. AD-619 958)

This study was conducted to determine t. feasibility of using direct perceptual estimation on maps to determine angles of drift and effect of training on this ability. Found that training produced significant increases in accuracy of angle estimation.

Warrington, D. N. and Hirnyck, W. T. Analysis of the visual observation produced by current artillery and mortar delivered WP and HC smoke (AMSAA-TR-199). Aberdeen Proving Ground, MD: Army Materiel Systems Analysis Activity, August 1977. (NTIS No. AD-A044 524)

An evaluation of the effect of the number of smoke rounds fired and the effect of the position of observers on the duration of target obscuration. Current artillery and mortar delivered white phosphorus (WP) and hexachloroethane (HC) smoke rounds were used.

White, R. W. Motivation reconsidered: The concept of competence. Psychological Review, 1959, 66, 297-333.

Describes effectance as another type of motivation, which drives the individual to learn to interact effectively with his environment. Activities which show direction, selectivity, and persistance in interacting with environment serve to give individual feeling of competence.

Whitehouse, W. H. Air Force forward air control and visual reconnaissance (RR-3849). Maxwell AFB, AL: Air War College, Air University, April 1969.(NTIS No. AD-908 520L)

Suggests an organization and methodology for having available, if war breaks out, trained air liaison officers - forward air controllers, strike control and reconnaissance pilots, and the like.

Whitmore, P. G. Use of the job model concept to guide job description procedures for Army officers (TR 73-26). Research for the Department of the Army, November 1973. (NTIS No. AD-772 993)

Describes development of job model and development of supplementary procedures for rectifying deficiencies.

Whitmore, P. G., Cox, J. A., and Friel, D. J. A classroom method of training aircraft recognition (HumRRO Tech. Rep. 68-1). Alexandria, VA: Human Resources Research Organization, January 1968.

Study to determine whether aircraft observers can be trained to a 95% level of recognition accuracy. Report makes recommendations for an aircraft recognition training program that will be both effective and capable of being implemented.

Whittenburg, J. A., Schreiber, A. L., and Richards, B. F. A field test of visual detection and identification for real and dummy targets (Research Memo). Fort Rucker, AL: U.S. Army Aviation Human Research Unit, April 1959. (NTIS No. AD-637 244)

Test to determine how well aerial observers could discriminate between real and dummy targets, what ambient and flight conditions affect this, and what visual cues were utilized.

Wienke, R. E. Weber's Law applied to distance estimation (HumRRO No. 26-67). Alexandria, VA: Human Resources Research Organization, June 1967. (NTIS No. AD-654 346)

Stimulus situation in dynamic range estimation was examined. Results of research on DRE show it is dependent on experimental conditions.

Willard, N., Jr., Bancroft, C. A., and Reddan, J. G. The training effectiveness of a stereoscopic range-finder trainer (TR-12). Fort Knox, KY: Human Research Unit No. 1, OCAFF, October 1954.

This experiment was designed to determine if the trainer could be used to identify good operators, as distinguished from those who need special training; be used for remedial training; and if it could provide satisfactory range-finder training. The data from the experiment show that the training device can aid in differentiating those operators who make normal progress from those who need special training; the device has no special value for training poor students; and that the use of it speeds up ranging operation during training.

Willemin, L. P., and Karcher, E. K. Development of combat aptitude areas (PRB Technical Research Report No. 1110). Washington, D.C.: Personnel Research Branch, Adjutant General's Office, January 1958.

A study which tried to improve the Army Classification Battery which is used to select personnel for military jobs.

Willemin, L. P., Birnbaum, A. H., and Rosenberg, N. Selection of experimental predictors for longitudinal validation in combat arms (PRB Tech. Research Note 72). Washington, D.C.: Adjutant General's Office, Personnel Research Branch, June 1957.

Reviews research leading up to final selection of experimental tests for use in larger study.

Willemin, L. P., Birnbaum, A. H., and Rosenberg, N. Validation of potential combat predictors: Research plan of longitudinal study (PRB Tech. Research Note 73). Washington, D.C.: Adjutant General's Office, Personnel Research Branch, June 1957b.

Study describes a method of collecting information on training and on-the-job performance for personnel selection.

Wolff, P. C., Burnstein, D. D., Haggard, D. F., and Van Loo, J. A. Group training with active participation: Some methodological limitations. Perceptual and Motor Skills, 1963, 16, 179-184.

Eighty enlisted men were matched on visual acuity and color discrimination and divided into four equal groups: a demonstration method, an active participation method, an untrained group, and a group of experts. Results indicate that the use of demonstration methods and response devices without adequate information to the individual subject about training progress can lead to learning to respond rather than learning to discriminate on relevant dimensions.

Wolff, P. C., Burnstein, D. D., and Van Loo, J. A. Effects of schedules of collective reinforcement on a class during a target detection course. Perceptual and Motor Skills, 1962, 15, 727-735.

Found that reinforcement of "easy responses" led students to make only easy detections, but reinforcement of "easy and difficult responses" led students to make more difficult detections. The ratio method led to better performance than percentage method.

Wolff, P. C., Burnstein, D. D., and Van Loo, J. A. Target detection: Study 6, The effects of schedules of collective reinforcement on a class during training in target detection. Paper for southeastern Psychological Association Meeting. Spring 1962. (NTIS No. AD-487 889L).

Results indicated no loss of effectiveness for group training, but verbal reinforcement did not significantly increase target detection performance.

Wolff, P. C., Van Loo, J. A., and Burnstein, D. D. Target detection: Study 7, Partial point-out targets as collective reinforcement in group target detection training (Research Memo). Alexandria, VA: Human Resources Research Organization, August 1962. (NTIS No. AD-488 446L)

Results indicated that collective reinforcement has effects similar to those which one would expect with individual reinforcement.

Youngling, E. W., Levine, S. H., Mocharnuk, J. B., and Weston, L. M. Feasibility study to predict combat effectiveness for selected Military roles: Fighter pilot effectiveness (MDC E1634). St. Louis, MO: McDonnell Douglas Corporation, April 1977.

This feasibility study focuses upon enhancing our record of air-to-air combat kills through more stringent and comprehensive selection procedures. Specifically, this document presents empirical evidence which demonstrates that a program can be effective in air-to-air combat.

ARMY OPERATIONS AND TRAINING PUBLICATIONS

Department of the Army. Field artillery cannon gunnery (FM 6-40). Washington, DC: Headquarters, Department of the Army, June 1974.

Department of the Army. Field artillery organizations (FM 6-140). Washington, DC: Department of the Army, Headquarters, April 1973.

Department of the Army. Field artillery target acquisition (FM 6-121). Washington, DC: Department of the Army, Headquarters, November 1967.

Department of the Army. Field artillery target acquisition: Battalion and batteries (FM 6-120). Washington, DC: Department of the Army, Headquarters, October 1967.

Department of the Army. Map reading (FM 21-26). Washington, DC: Department of the Army, Headquarters, January 1969.

Department of the Army. Modern battlefield cannon gunnery (FM 6-40-5). Washington, DC: Department of the Army, Headquarters, July 1976.

U.S. Army. The field artillery observer (FM 6-30). Washington, D.C.: Headquarters, Department of the Army, August 1978.

U.S. Army Field Artillery School. Adjustment of fire, reference note (RN GO-AK, SEP 74). Fort Sill, OK: Gunnery Department, February 1976.

U.S. Army Field Artillery School. Adjustment of mortars, handout (GD-D1 HO 2). Fort Sill, OK: Gunnery Department, January 1978.

U.S. Army Field Artillery School. Course of instruction for 2-6-C20, Field artillery officer basic course SS1:13E (COI 2-6-C20). Fort Sill, OK: Author, June 1977.

U.S. Army Field Artillery School. Course of instruction for 250-13F10, Field artillery fire support specialist course. Fort Sill, OK: Author, March 1978.

U.S. Army Field Artillery School. Field artillery cannon gunnery, vol. 1 (FM 6-30). Fort Sill, OK: Author, October 1977.

U.S. Army Field Artillery School. Field artillery counterfire: How to attack enemy cannon, mortar, and rockets (TC 6-20-4). Fort Sill, OK: Author, September 1975.

U.S. Army Field Artillery School. Field artillery lieutenants manual. Fort Sill, OK: Author, July 1977.

U.S. Army Field Artillery School. Field artillery reference data (FAS Rpt. 70D01). Fort Sill, OK: Author, April 1970.

U.S. Army Field Artillery School. Field artillery target acquisition, reference note (AT 1000). Fort Sill, OK: Author, Counterfire Department, June 1976.

U.S. Army Field Artillery School. Final protective fires, handout (GD-DI HO 1). Fort Sill, OK: Gunnery Department, January 1978.

U.S. Army Field Artillery School. Fire for effect: How to be your own forward observer (TC 6-40-4). Fort Sill, OK: Author, February 1978.

U.S. Army Field Artillery School. The fire support team (TC 6-20-10). Fort Sill, OK: Tactics and Combined Arms Department, October 1978.

U.S. Army Field Artillery School. The forward observer, reference note (RN GO-AC, NOV 76). Fort Sill, OK: Gunnery Department, November 1976.

U.S. Army Field Artillery School. 14.5-mm field artillery trainer M31, reference note (RN GOF702, OCT 72). Fort Sill, OK: Gunnery Department, February 1975.

U.S. Army Field Artillery School. Map reading: Altitude and relief (PT2 E061AS24A, 04106AS24A. Fort Sill, OK: Counterfire Department, January 1977.

U.S. Army Field Artillery School. Map reading: Definition, classification, marginal information, topographic symbols (PT2 E061AS21A, 041061AS21A). Fort Sill, OK: Counterfire Department, January 1977.

U.S. Army Field Artillery School. Map reading: Direction (PT2 E061AS23A, 04106AS23A). Fort Sill, OK: Counterfire Department, January 1977.

U.S. Army Field Artillery School. Map reading: Location (PT2 E061AS22A, 041061AS22A). Fort Sill, OK: Counterfire Department, January 1977.

U.S. Army Field Artillery School. Night observation device, medium range, handout (HO-GO--AT, SEP 1975). Fort Sill, OK: Gunnery Department, September 1975.

U.S. Army Field Artillery School. Observed fire target location (shift from a known point) programmed text (study guide) (PT061G001A). Fort Sill, OK: Gunnery Department, March 1977.

U.S. Army Field Artillery School. Observed fire, workbook (OF WB 1, sec I). Fort Sill, OK: Gunnery Department, January 1976.

U.S. Army Field Artillery School. Prepare and transmit message to observer, study guide (13E-1255 SG). Fort Sill, OK: Gunnery Department, March 1978.

U.S. Army Field Artillery School. Shell fuze combination and visual effects, study guide (13E-1255 SG). Fort Sill, OK: Gunnery Department, December 1977.

U.S. Army Field Artillery School. Soldier's manual MOS 13F, fire support specialist skill level 1/2 (FM 6-13F 1/2). Fort Sill, OK: Author, June 1977.

U.S. Army Field Artillery School. Soldier's manual 13F fire support specialist - skill level 1 and 2 (FM 6-13F 1/2). Fort Sill, OK: Author, July 1976.

U.S. Army Field Artillery School. Special missions - Fire direction and forward observer procedures, reference note (RN 6D--DI, Jul 77). Ft. Sill, OK: Gannery Department, July 1977.

APPENDIX A: FORWARD OBSERVER PERSONAL PROFILE QUESTIONNAIRE (DEVELOPMENTAL FORM A) WITH COMBINED PERCENTAGES OF RESPONSE FROM OBC 12-78 AND OBC 1-79, AND FORWARD OBSERVER PERSONAL PROFILE QUESTIONNAIRE (DEVELOPMENTAL FORM B)

FORWARD OBSERVER PERSONAL PROFILE QUESTIONNAIRE

(DEVELOPMENTAL FORM A)

DATA REQUIRED BY THE PRIVACY ACT OF 1974
(5 USC 552A)

TITLE OF FORM: Forward Observer Personal Profile Questionnaire (Developmental Form A), PT5256A

PRESCRIBING DIRECTIVE: AR 70-1

AUTHORITY: 10 USC SEC 4503

PRINCIPAL PURPOSE: The data collected with the attached form are to be used for research purposes only.

ROUTINE USES: This is an experimental personnel data collection form developed by the Army Research Institute for the Behavioral and Social Sciences and its contractor pursuant to its research mission as prescribed in AR 70-1. When identifiers (Name and Social Security Number) are requested, they are to be used for administrative and statistical control purposes only. Full confidentiality of the responses will be maintained in the processing of these data.

Your participation in this research is strictly voluntary. Individuals are encouraged to provide complete and accurate information in the interest of the research, but there will be no effect on individuals for not providing all or any part of the information. This notice may be detached from the rest of the form and retained by the individual if so desired.

Materials contained in this questionnaire have been derived from: A) "Character Profile of the West Virginia Coal Miners: Analysis of Demographic, Personal, Attitudinal, and Academic Achievement Data," McDonnell Douglas Astronautics Company - East, August 1976, prepared by Arnold E. Nelson, Ruth Ann Marco, and Amy L. Banks; B) "The Pilot Life Inventory Questionnaire," McDonnell Douglas Astronautics Company - East, April 1977, prepared by Edward W. Youngling, Sheldon H. Levine, John B. Mocharnuk, and Louise M. Weston.

SECTION A

(For questions in this section mark as many answers as apply.)

(1) Which of the following outdoor activities have you engaged in fairly often? (Mark all that apply.)

10%	1.	Four-wheeling (e.g., jeeps, scouts)	21%	13.	Orienteering
3%	2.	Road rallies	49%	14.	Camping
6%	3.	Car racing	7%	15.	Cross-country bicycling
10%	4.	Archery	11%	16.	Scuba diving
6%	5.	Cross-country skiing	18%	17.	Horseback riding
29%	6.	Boating	1%	18.	Hang gliding
32%	7.	Marksmanship	1%	19.	Soaring (gliders)
12%	8.	Skeet or trap shooting	35%	20.	Hiking
4%	9.	Spelunking	1%	21.	Bird watching
7%	10.	Sky diving	14%	22.	Mountain climbing
10%	11.	Dirt biking	24%	23.	Golf
34%	12.	Hunting	55%	24.	Football
			47%	25.	Baseball

(2) In which of these have you ever participated? (Circle all that apply.)

11% 1. Ranger training
21% 2. Survival training
20% 3. Enlisted basic infantry training (as a trainee)
67% 4. Sand lot/street games
8% 5. 4-H Club
5% 6. Future Farmers of America
21% 7. Worked or studied most of the time and did not participate.

(3) Which was the highest grade you reached in the Boy Scouts of America?

14% 1. Tenderfoot or Second Class Scout
11% 2. First Class Scout
13% 3. Star Scout or Life Scout
13% 4. Eagle Scout
47% 5. Did not belong to the Boy Scouts

(4) Which mathematics courses have you completed? (Circle all that apply.)

67% 1. Plane geometry
40% 2. Solid geometry
39% 3. Analytical geometry
68% 4. College algebra
54% 5. Trigonometry
47% 6. Calculus

(5) Which of the following describes your experience with radios? (Circle all that apply.)

4% 1. I am a ham operator.
38% 2. I have a CB.
8% 3. I hold an FCC 3rd class license.
2% 4. I hold an FCC 1st class license.
13% 5. I have done radio repair work.

(6) Which of the following have you operated? (Mark all that apply.)

92% 1. Typewriter
75% 2. Adding machine
57% 3. Cash register
92% 4. Calculator
40% 5. Keypunch
47% 6. Computer
55% 7. Slide Rule

(7) How do you usually spend your leisure time? (Mark all that apply.)

30% 1. Reading professional literature
43% 2. Reading novels
65% 3. Going to movies and dances
69% 4. Participating in sports
62% 5. Observing sports
70% 6. Viewing television
49% 7. Pursuing hobby
45% 8. Family activities
40% 9. House and yard work
3% 10. None of the above

(8) Which of the following characterize your parents' supervision of you when you were growing up? (Mark as many as apply.)

21% 1. Strict
71% 2. Fair
12% 3. Lenient
10% 4. Permissive
1% 5. Harsh
0% 6. Cruel

(9) When you were a boy, where did you spend your summer vacations? (Mark a many as apply.)

77%	1.	At home
33%	2.	At camp
7%	3.	At day camp
9%	4.	At my family's summer camp or home
21%	5.	With other relatives in the country
9%	6.	With friends in the country
48%	7.	At work
19%	8.	With relatives or friends in another town
46%	9.	Taking occasional short trips
15%	10.	On a long trip
22%	11.	On day trips with my family
37%	12.	On day trips for swimming, picnicking, etc., with my own crowd
17%	13.	Summer school

(10) In which of the following activities have you and your family, or member of the group with which you lived, engaged fairly often? (Mark as many as apply.)

16%	1.	Made such things as toys, play equipment, gifts, furniture together
45%	2.	Listened to music together
43%	3.	Entertained each other's friends
45%	4.	Attended social gatherings
47%	5.	Talked about our day's activities together
67%	6.	Went on trips together
65%	7.	Went on vacations together
43%	8.	Engaged in sports together
52%	9.	Included neighbors and friends in our good times, both mine and theirs

(11) Which of the following things do you remember doing often as a child?

9%	1.	Having nightmares
6%	2.	Crying
5%	3.	Playing hookey
20%	4.	Biting fingernails
12%	5.	Telling lies to avoid punishment
2%	6.	Running away from home
62%	7.	None of these

SECTION B

(In this section mark the single best answer for each question.)

(1) What was the regular work of your father? (If the income of your family came chiefly from someone other than your father, show the regular kind of work of that person.)

38% 1. Professional - such as architect, artist, engineer, musician, author, chemist, teacher, professor, doctor, dentist, lawyer, military officer, etc.

18% 2. Proprietor, Manager, or Official - such as a store owner, wholesale dealer, manufacturer, farm owner, builder, company official, banker, government official or inspector, etc.

4% 3. Clerical or sales worker such as work in a store office, salesman, bookkeeper, stenographer, technical assistant, etc.

25% 4. Skilled worker or foreman -

a. Mason, carpenter, electrician, mechanic, etc.
b. Tailor, baker, butcher, seamstress, etc.
c. Foreman in factory, farm, mine, etc.
d. Public service employee - fireman, policeman.

8% 5. Semiskilled worker - such as apprentice, factory operative, sailor, chauffeur, delivery man, attendant, grocery clerk, etc.

5% 6. Unskilled worker - such as laborer in factory, farm, or construction, fisherman, longshoreman, elevator man, domestic servant, etc.

(2) In how many different cities, town, or townships have you lived?

47% 1. 1 to 3
22% 2. 4 to 6
13% 3. 7 to 9
10% 4. 10 to 12
8% 5. 13 or more

(3) In your home town what was the major source of income?

16% 1. Agriculture, dairy, etc.
22% 2. Industry or manufacturing
8% 3. Wholesale, retail, or tourist trade
2% 4. Petroleum or mining
3% 5. College
8% 6. Military base
41% 7. Diversified

SECTION B - Page 2

(4) Which of these best describes the type of environment from which you came?

18% 1. Urban
56% 2. Suburban
27% 3. Rural

(5) The population of the town I grew up in was:

5% 1. Under 1000
11% 2. 1000 - 5000
21% 3. 5000 - 25,000
23% 4. 25,000 - 100,000
17% 5. 100,000 - 500,000
15% 6. Over 500,000

(6) How old were you when your parents first left you alone or in charge of younger siblings?

23% 1. 8 or less
27% 2. 9 or 10
29% 3. 11 or 12
12% 4. 13 or 14
4% 5. 15 or over

(7) How old were you when you had your first regular paid job, part-time or full-time?

21% 1. 12 years or less
50% 2. 13 to 15
27% 3. 16 to 18
1% 4. 19 or older

(8) While you were growing up, to what extent was taking responsibility for your actions emphasized?

55% 1. Very much
32% 2. Much
10% 3. Not too much
0% 4. Not at all
4% 5. I don't remember

(9) How difficult for you were changes from one school or college to another?

1% 1. Difficult and disagreeable
12% 2. Somewhat difficult and disagreeable
65% 3. Easily enough made
11% 4. Fun
11% 5. I did not make these kinds of changes

(10) To what extent did your father or mother stress the importance of getting ahead in the world?

36% 1. Very often
37% 2. Fairly often
20% 3. Once in a while
6% 4. Rarely
2% 5. Never

(11) As a youth I:

66% 1. Had few or no fights
26% 2. Had several fights
7% 3. Fought frequently

(12) It bothers me to lose a game.

26% 1. Very much
57% 2. Somewhat
14% 3. Very little
3% 4. Not at all

(13) How often do you seek advice and aid from other people?

5% 1. Very often
34% 2. Often
52% 3. Once in a while
9% 4. Rarely
0% 5. Never

(14) Have you ever found yourself in a situation where you just didn't know what to do?

1% 1. Very often
6% 2. Often
50% 3. Once in a while
38% 4. Rarely
5% 5. Never

(15) I like to do things my own way, regardless of what others say or do.

17% 1. Very much
62% 2. Somewhat
19% 3. Very little
2% 4. Not at all

(16) How many fights did you have from age 18 or older?

61% 1. 0
28% 2. 1 or 2
8% 3. 3 to 5
1% 4. 5 to 10
1% 5. More than 10

(17) I like to supervise or direct the actions of others.

56% 1. Very much
41% 2. Somewhat
3% 3. Very little
3% 4. Not at all

(18) As a boy, how frequently did you take a dare?

6% 1. Almost always
20% 2. Usually
52% 3. Sometimes and sometimes not
19% 4. Almost never
3% 5. Never

(19) How much independence do you feel your parents allowed you while in high school?

13% 1. Quite restrictive
47% 2. About as much as the rest of my friends
21% 3. Quite lenient
18% 4. As much as I wanted
1% 5. Practically none

(20) As a child, did you have an opportunity to putter around a work shop, at home or elsewhere?

32% 1. Often
33% 2. Occasionally
34% 3. Very rarely

(21) Which one of the following activities would you enjoy most?

21%	1.	Developing the theory of operation of a new machine, e.g., auto
17%	2.	Supervising the manufacture of the machine
8%	3.	Determining the cost of operation of the machine
7%	4.	Selling the machine
9%	5.	Preparing the advertising for the machine
28%	6.	Teaching others the use of the machine
11%	7.	Interesting the public in the machine through public speeches

(22) Which of the following best describes the college you attended as an undergraduate?

65%	1.	A state college, or a college controlled by some other government unit, e.g., a municipal college
8%	2.	A college controlled by a religious group
17%	3.	A privately controlled, endowed college
8%	4.	Something else
1%	5.	Did not attend college

(23) How many students were there in the college you attended?

2%	1.	Did not attend college
17%	2.	Under 2000
32%	3.	2000 to 5000
20%	4.	5000 to 10,000
30%	5.	Over 10,000

(24) What was your scholastic standing in college?

2%	1.	Did not attend college
31%	2.	Upper 25% of class
55%	3.	Middle 50% of class
11%	4.	Lower 25% of class

(25) In which academic courses did you receive your highest grades?

3%	1.	Did not attend college or grades were same in courses
17%	2.	Math, physics, chemistry or engineering
7%	3.	Biology or physiology
10%	4.	English or journalism
11%	5.	Business or commerce
3%	6.	Foreign languages
25%	7.	History or political science
10%	8.	Psychology or education
15%	9.	Some field not mentioned

(26) In the past, how have you reacted to competition?

73% 1. Have done my best in competitive situations
10% 2. Have been unaffected by it
10% 3. Have done all right, but haven't liked it
3% 4. Unfavorably
2% 5. In some unspecified way

(27) When you need to solve a tough work problem, what do you usually do?

33% 1. Sit down and figure it out myself
8% 2. Talk it over with my wife or friends
8% 3. Talk it over with some of the fellows at work
4% 4. Talk it over with my boss or other superiors
5% 5. Let it ride for awhile, then tackle it with a fresh eye
42% 6. Something else or some combination of the above

(28) With regard to taking risks, which best describes you?

12% 1. Hardly ever take a risk
65% 2. Sometimes take a risk
19% 3. Generally take a risk
4% 4. I'm a gambler at heart

(29) How does the responsibility for a difficult decision affect you?

44% 1. It stimulates me
5% 2. It disturbs me
42% 3. It makes me cautious
8% 4. Something else

(30) When you have a chance, how do you lead people?

5% 1. By driving them
24% 2. By showing them
1% 3. By kidding them into going along
63% 4. By setting an example
7% 5. Some other way

(31) When working on a project, do you do it over and over until you get it right?

52% 1. Often
33% 2. Occasionally
10% 3. Sometimes
4% 4. Rarely

(32) How do you tend to react to an unpleasant situation?

59%	1.	Generally try to react immediately and figure out the best solution
31%	2.	Most of the time I put off a decision for a little while so I can think it over
3%	3.	Often want to sleep on it or put off a decision for quite a while
6%	4.	I don't worry about it; things will take care of themselves

(33) What do you consider to be the major motivating force in your life? (Rank order those which apply.)

Mean Rank	% of Students Ranking an Item #1		
2.9	19	A.	Prestige
3.2	7	B.	Material gains
3.5	3	C.	To come up with something new
2.3	31	D.	To gain a position of security
2.6	17	E.	To help others
3.2	20	F.	Something else

SECTION C

(In this section mark the single best answer for each question.)

(1) When did you first want to join the Army?

18% 1. In grade school
34% 2. In high school
41% 3. In college
5% 4. After college

(2) What was your first branch choice?

38% 1. Artillery
7% 2. Infantry
10% 3. Armor
7% 4. Combat engineer
4% 5. Finance
7% 6. Adjutant General
27% 7. Other noncombat branch

(3) Under which type of commander would you most like to serve?

23% 1. Tolerant in both garrison and in the battle area (field environment)
44% 2. Tolerant in garrison, demanding in the battle area (field environment)
2% 3. Tolerant in the battle area (field environment), demanding in garrison
29% 4. Demanding in garrison and in the battle area (field environment)

(4) When did you first become interested in being an artillery officer?

1% 1. In grade school
3% 2. In high school
37% 3. In college
41% 4. After entering the Army

(5) Off the job, I prefer to spend time:

11% 1. With nonmilitary personnel
27% 2. With other officers
32% 3. With my family
1% 4. At the Officer's Club
24% 5. With my girlfriend
3% 6. Alone

(6) How long do you expect to serve as an FO?

52% 1. Under one year
40% 2. 1 - 2 years
4% 3. 3 years
3% 4. 4 years or more

(7) During actual combat a good forward observer is likely to be:

11% 1. Calm
20% 2. Somewhat nervous before and calm during combat
39% 3. Tense and alert at all times
30% 4. Apprehensive but doing his best in spite of it

(8) Most failures to hit the target result from:

17% 1. A breakdown in communications
58% 2. Inadequate performance by the FO
3% 3. Inadequate equipment
2% 4. Errors on the part of the gun crew
1% 5. Errors in the FDC
15% 6. Gun error and weather factors

Name:______________________________ SSN:______________________

SECTION D

(In this section mark the single best answer for each question.)

		Scale Value	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(1)	College training has little to do with being a good artillery officer.	3.22	11%	26%	8%	43%	13%
(2)	Off-duty time for officers should be completely their own.	2.12	36%	37%	6%	20%	1%
(3)	Being an FO is a rewarding job.	2.52	10%	44%	35%	7%	5%
(4)	In order to achieve greater accuracy, the FO is likely to take many chances.	2.85	7%	36%	22%	32%	3%
(5)	Less time should be spent on FO training and more on career related/administrative skills training.	3.69	3%	10%	19%	51%	16%
(6)	I am quite concerned about doing a good job as an FO.	1.78	41%	46%	9%	3%	1%
(7)	High hit probability is a function of chance not skill.	4.29	2%	4%	5%	42%	47%
(8)	I like being an officer because it is a secure job.	2.85	9%	38%	21%	26%	6%
(9)	I expect to be in the Army ten years from now.	2.71	19%	26%	33%	13%	10%
(10)	Sometimes in combat your own command and control can be your worst enemy.	1.85	10%	38%	25%	22%	5%
(11)	Training to be an FO in peacetime is:						
	A. Of reduced importance since officers may spend much of their time performing administrative functions.	3.51	4%	20%	9%	41%	17%
	B. Important for maintaining combat readiness.	1.52	25%	45%	28%	2%	0%
(12)	Being an officer is a rewarding career.	1.80	41%	43%	13%	1%	1%

		Scale Value	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(13)	Using common sense as a Forward Observer is as important as following the correct procedures.	1.54	52%	44%	3%	1%	0%
(14)	Being an effective Forward Observer is a stand alone job.	3.44	5%	16%	18%	49%	11%
(15)	A good forward observer will spend as many hours as he can practicing FO tasks.	2.36	9%	59%	19%	13%	1%
(16)	The difference between hitting the target the first time and missing it is often a matter of luck.	3.40	2%	28%	11%	47%	12%
(17)	A Forward Observer may live or die on the basis of his own competence.	1.72	41%	49%	7%	2%	1%
(18)	Prior experience as an enlisted man makes one a better Forward Observer.	2.88	10%	25%	36%	24%	5%
(19)	To progress as an Artillery Officer you do not have to be an above average FO.	2.94	3%	38%	25%	29%	5%
(20)	The job of the FO cannot be taught in the classroom. It requires on the job training.	2.00	33%	48%	5%	13%	1%
(21)	My precommission military training has given me the skills needed to perform well in OBC.	2.76	14%	38%	16%	20%	11%
(22)	A definite performance advantage as a Forward Observer results from previous training in:						
	A. A military prep school	2.79	4%	22%	34%	19%	25%
	B. West Point	2.45	15%	29%	29%	12%	5%
	C. A military college other than West Point	2.62	7%	29%	33%	14%	6%
	D. ROTC	3.14	2%	21%	28%	32%	10%
	E. OCS	2.50	7%	37%	31%	12%	3%

Name:________________________________ SSN:______________________

SECTION E

(In this section mark the single best answer for each question.)

		Scale Value	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(1)	I think that weight lifting beyond keeping in shape reflects insecurity.	3.40	2%	17%	31%	39%	11%
(2)	I would rather be thought of as athletic rather than smart.	3.56	2%	9%	26%	55%	7%
(3)	I would like to be thought of as "Macho".	3.29	2%	25%	26%	36%	12%
(4)	I think planning is necessary when you do anything.	1.79	35%	51%	1%	6%	0%
(5)	People often say I'm too slow in making up my mind.	3.76	1%	11%	13%	60%	14%
(6)	I sometimes do things without completely thinking them through.	2.90	3%	48%	8%	35%	5%
(7)	Many times I feel I have little influence over the things that happen to me.	3.45	3%	22%	11%	52%	12%
(8)	I have very few quarrels with members of my family.	2.27	20%	51%	11%	17%	1%
(9)	I prefer to think about several possible solutions before making a decision.	1.91	21%	72%	5%	3%	0%
(10)	What happens to me is my own doing.	2.49	11%	55%	11%	20%	3%
(11)	In my case, getting what I want has little or nothing to do with luck.	2.53	9%	53%	14%	20%	3%
(12)	I am often said to be hot-headed.	3.73	2%	15%	9%	54%	19%
(13)	I learn something better when I'm studying alone.	2.80	9%	39%	13%	13%	1%
(14)	At times I have a strong urge to do something shocking.	2.97	5%	38%	16%	35%	6%
(15)	I often try to do more than one thing at a time.	2.38	11%	61%	7%	18%	2%

SECTION E - Page 2

		Scale Value	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(16)	I quite often do things on the "spur of the moment."	2.57	10%	51%	11%	26%	1%
(17)	A man should never show his emotions.	3.90	2%	8%	3%	63%	26%
(18)	A good philosophy is to grin and bear it.	2.72	7%	47%	15%	26%	5%
(19)	Becoming a success is a matter of hard work; luck has little or nothing to do with it.	2.44	15%	52%	8%	24%	1%
(20)	One should abandon an activity that he enjoys if friends criticize it.	4.15	2%	4%	3%	58%	33%
(21)	It is important to have your work organized and planned before starting it.	1.84	24%	70%	4%	1%	1%
(22)	It's not important if you are the very best in a field as long as you are doing the best you can.	2.11	23%	58%	5%	14%	1%
(23)	Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.	2.60	14%	42%	16%	24%	3%
(24)	There is a large difference between taking calculated risks and taking chances.	2.05	20%	63%	8%	8%	1%
(25)	It is very important to be successful in things you try to do.	2.03	22%	61%	9%	7%	1%
(26)	Without the right breaks one cannot attain preferred leadership positions.	3.08	5%	31%	18%	42%	46%
(27)	When not feeling well one should try to go to work anyway.	2.53	5%	55%	17%	21%	1%
(28)	It is often better to give in and avoid a fight than to try to have things your own way.	3 11	5%	33%	1%	38%	8%
(29)	In a combat situation the saying "When your number is up, you've had it," has a lot of truth in it.	3.32	3%	24%	25%	36%	12%
(30)	The best leaders come forward only when the situation demands it.	3.06	8%	32%	13%	39%	7%

SECTION E - Page 3

	Scale Value	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(31) I like to read:						
A. Newspapers	1.83	28%	61%	3%	4%	1%
B. Magazines	1.81	27%	67%	3%	1%	1%
C. Fiction	2.22	20%	58%	13%	14%	2%
D. Nonfiction	2.05	21%	53%	12%	9%	1%
(32) Doing minor mechanical or electrical repairs is self-rewarding.	2.10	24%	54%	12%	7%	2%
(33) Building furniture and other woodworking activities is a waste of time.	4.02	3%	4%	13%	47%	32%
(34) Building model trains, ships, or cars is enjoyable.	2.42	14%	47%	25%	11%	2%
(35) I like to paint or make sketches in my spare time.	3.26	6%	16%	32%	38%	7%
(36) For most routine car repairs and servicing, I would rather do it myself than take it to a repair shop.	2.09	30%	48%	7%	12%	3%
(37) Building electrical equipment like stereos is a satisfying activity.	2.73	9%	29%	41%	17%	3%

FORWARD OBSERVER PERSONAL PROFILE QUESTIONNAIRE

(DEVELOPMENTAL FORM B)

DATA REQUIRED BY THE PRIVACY ACT OF 1974
(5 USC 552A)

TITLE OF FORM: Forward Observer Personal Profile Questionnaire (Developmental Form B), PT5256C.

PRESCRIBING DIRECTIVE: AR 70-1

AUTHORITY: 10 USC SEC 4503

PRINCIPAL PURPOSE: The data collected with the attached form are to be used for research purposes only.

ROUTINE USES: This is an experimental personnel data collection form developed by the Army Research Institute for the Behavioral and Social Sciences and its contractor pursuant to its research mission as prescribed in AR 70-1. When identifiers (Name and Social Security Number) are requested, they are to be used for administrative and statistical control purposes only. Full confidentiality of the responses will be maintained in the processing of these data.

Your participation in this research is strictly voluntary. Individuals are encouraged to provide complete and accurate information in the interest of the research, but there will be no effect on individuals for not providing all or any part of the information. This notice may be detached from the rest of the form and retained by the individual if so desired.

Materials contained in this questionnaire have been derived from: A) "Character Profile of the West Virginia Coal Miners: Analysis of Demographic, Personal, Attitudinal, and Academic Achievement Data," McDonnell Douglas Astronautics Company-St. Louis, August 1976, prepared by A. E. Nelson, R. A. Marco, and A. L. Banks; B) "The Pilot Life Inventory Questionnaire," McDonnell Douglas Astronautics Company-St. Louis, April 1977, prepared E. W. Youngling, S. H. Levine, J. B. Mocharnuk, and L. M. Weston.

DEVELOPMENTAL FORM B

SECTION A

(For questions in this section mark as many answers as apply.)

(1) Which of the following outdoor activities have you engaged in fairly often? (Mark all that apply.)

1. Four wheeling (e.g., jeeps, scouts)
2. Cross-country skiing
3. Marksmanship
4. Skeet or trap shooting
5. Dirt biking
6. Hunting
7. Camping
8. Cross-country bicycling
9. Scuba diving
10. Horseback riding
11. Hiking
12. Bird watching
13. Mountain climbing
14. Golf
15. Football
16. Baseball

(2) In which of these have you ever participated? (Mark all that apply.)

1. Ranger training
2. Survival training
3. Enlisted basic infantry training (as a trainee)
4. Sand lot/street games
5. 4-H Club
6. Future Farmers of America
7. Worked or studied most of the time and did not participate.

(3) Which mathematics courses have you completed? (Mark all that apply.)

1. Plane geometry
2. Solid geometry
3. Analytic geometry
4. College algebra
5. Trigonometry
6. Calculus

(4) Which of the following have you operated? (Mark all that apply.)

1. Typewriter
2. Adding Machine
3. Cash Register
4. Calculator
5. Keypunch
6. Computer
7. Slide Rule

(5) How do you usually spend your leisure time? (Mark all that apply.)

1. Reading professional literature
2. Reading novels
3. Going to movies and dances
4. Participating in sports
5. Observing sports
6. Viewing television
7. Pursuing hobby
8. Family activities
9. House and yard work
10. None of the above

SECTION A - Page 2

(6) When you were a boy, where did you spend your summer vacations? (Mark as many as apply.)

1. At home
2. At camp
3. At day camp
4. With other relatives in the country
5. At work
6. With relatives or friends in another town
7. Taking occasional short trips
8. On a long trip
9. On day trips with my family
10. On day trips for swimming, picnicking, etc., with my own crowd
11. Summer school

(7) In which of the following activities have you and your family, or members of the group with which you lived, engaged fairly often? (Mark as many as apply.)

1. Listened to music together
2. Entertained each other's friends
3. Attended social gatherings
4. Talked about our day's activities together
5. Went on trips together
6. Went on vacations together
7. Engaged in sports together
8. Included neighbors and friends in our good times, both mine and theirs

(8) Which of the following things do you remember doing often as a child? (Mark as many as apply.)

1. Having nightmares
2. Crying
3. Biting fingernails
4. Telling lies to avoid punishment
5. Running away from home
6. None of these

SECTION B

(In this section mark the single best answer for each question.)

(1) Which of these best describes the type of environment from which you came?

1. Urban
2. Suburban
3. Rural

(2) Which was the highest grade you reached in the Boy Scouts of America?

1. Tenderfoot or Second Class Scout
2. First Class Scout
3. Star Scout or Life Scout
4. Eagle Scout
5. Did not belong to the Boy Scouts

(3) The population of the town I grew up in was:

1. Under 1000
2. 1000 - 5000
3. 5000 - 25,000
4. 25,000 - 100,000
5. 100,000 - 500,000
6. Over 500,000

(4) How difficult for you were changes from one school or college to another?

1. Difficult and disagreeable
2. Somewhat difficult and disagreeable
3. Easily enough made
4. Fun
5. I did not make these kinds of changes

(5) To what extent did your father or mother stress the importance of getting ahead in the world?

1. Very often
2. Fairly often
3. Once in a while
4. Rarely
5. Never

(6) Have you ever found yourself in a situation where you just didn't know what to do?

1. Very often
2. Often
3. Once in a while
4. Rarely
5. Never

(7) I like to supervise or direct the actions of others.

1. Very much
2. Somewhat
3. Very little
4. Not at all

(8) As a child, did you have an opportunity to putter around a work shop, at home or elsewhere?

1. Often
2. Occasionally
3. Very rarely

(9) Which one of the following activities would you enjoy most?

1. Developing the theory of operation of a new machine, e.g., auto
2. Supervising the manufacture of the machine
3. Determining the cost of operation of the machine
4. Selling the machine
5. Preparing the advertising for the machine
6. Teaching others the use of the machine
7. Interesting the public in the machine through public speeches

(10) Which of the following best describes the college you attended as an undergraduate?

1. A state college, or a college controlled by some other government unit, e.g., a municipal college
2. A college controlled by a religious group
3. A privately controlled, endowed college
4. Something else
5. Did not attend college

(11) In which academic courses did you receive your highest grades?

1. Did not attend college or grades were same in courses
2. Math, physics, chemistry or engineering
3. Biology or physiology
4. English or journalism
5. Business or commerce
6. Foreign languages
7. History or political science
8. Psychology or education
9. Some field not mentioned

(12) In the past, how have you reacted to competition?

1. Have done my best in competitive situations
2. Have been unaffected by it
3. Have done all right, but haven't liked it
4. Unfavorably
5. In some unspecified way

(13) When you need to solve a tough work problem, what do you usually do?

1. Sit down and figure it out myself
2. Talk it over with my wife or friends
3. Talk it over with some of the fellows at work
4. Talk it over with my boss or other superiors
5. Let it ride for awhile, then tackle it with a fresh eye
6. Something else or some combination of the above

(14) How does the responsibility for a difficult decision affect you?

1. It stimulates me
2. It disturbs me
3. It makes me cautious
4. Something else

(15) When you have a chance, how do you lead people?

1. By driving them
2. By showing them
3. By kidding them into going along
4. By setting an example
5. Some other way

(16) When working on a project, do you do it over and over until you get it right?

1. Often
2. Occasionally
3. Sometimes
4. Rarely

(17) How do you tend to react to an unpleasant situation?

1. Generally try to react immediately and figure out the best solution
2. Most of the time I put off a decision for a little while so I can think it over
3. Often want to sleep on it or put off a decision for quite a while
4. I don't worry about it; things will take care of themselves

(18) What do you consider to be the major motivating force in your life? (Rank order those which apply.)

A. Prestige
B. Material gains
C. To come up with something new
D. To gain a position of security
E. To help others
F. Something else

SECTION C

(In this section mark the single best answer for each question.)

(1) What was your first branch choice?

1. Artillery
2. Infantry
3. Armor
4. Combat engineer
5. Finance
6. Adjutant General
7. Other noncombat branch

(2) Under which type of commander would you most like to serve?

1. Tolerant in both garrison and in the battle area (field environment)
2. Tolerant in garrison, demanding in the battle area (field environment)
3. Tolerant in the battle area (field environment), demanding in garrison
4. Demanding in garrison and in the battle area (field environment)

(3) When did you first become interested in being an artillery officer?

1. In grade school
2. In high school
3. In college
4. After entering the Army

(4) Off the job, I prefer to spend time:

1. With nonmilitary personnel
2. With other officers
3. With my family
4. At the Officer's Club
5. With my girlfriend
6. Alone

(5) Most failures to hit the target result from:

1. A breakdown in communications
2. Inadequate performance by the FO
3. Inadequate equipment
4. Errors on the part of the gun crew
5. Errors in the FDC
6. Gun error and weather factors

Name: ______________________ SSN: ______________________

SECTION D

(In this section mark the single best answer for each question.)

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(1) Being an FO is a rewarding job.	( )	( )	( )	( )	( )
(2) Less time should be spent on FO training and more on career related/administrative skills training.	( )	( )	( )	( )	( )
(3) High hit probability is a function of chance not skill.	( )	( )	( )	( )	( )
(4) I like being an officer because it is a secure job.	( )	( )	( )	( )	( )
(5) I expect to be in the Army ten years from now.	( )	( )	( )	( )	( )
(6) Sometimes in combat your own command and control can be your worst enemy.	( )	( )	( )	( )	( )
(7) Training to be an FO in peacetime is:	( )	( )	( )	( )	( )
A. Of reduced importance since officers may spend much of their time performing administrative functions.	( )	( )	( )	( )	( )
B. Important for maintaining combat readiness.	( )	( )	( )	( )	( )
(8) Being an officer is a rewarding career.	( )	( )	( )	( )	( )
(9) Using common sense as a Forward Observer is as important as following the correct procedures.	( )	( )	( )	( )	( )
(10) A good forward observer will spend as many hours as he can practicing FO tasks.	( )	( )	( )	( )	( )
(11) The difference between hitting the target the first time and missing it is often a matter of luck.	( )	( )	( )	( )	( )
(12) A Forward Observer may live or die on the basis of his own competence.	( )	( )	( )	( )	( )
(13) Prior experience as an enlisted man makes one a better Forward Observer.	( )	( )	( )	( )	( )
(14) To progress as an Artillery Officer you do not have to be an above average FO.	( )	( )	( )	( )	( )

Name:________________________________ SSN:________________________________

SECTION E

(In this section mark the single best answer for each question.)

		Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(1)	I would rather be thought of as athletic than smart.	( )	( )	( )	( )	( )
(2)	I think planning is necessary when you do anything.	( )	( )	( )	( )	( )
(3)	People often say I'm too slow in making up my mind.	( )	( )	( )	( )	( )
(4)	Many times I feel I have little influence over the things that happen to me.	( )	( )	( )	( )	( )
(5)	I have very few quarrels with members of my family.	( )	( )	( )	( )	( )
(6)	What happens to me is my own doing.	( )	( )	( )	( )	( )
(7)	I am often said to be hot-headed.	( )	( )	( )	( )	( )
(8)	At times I have a strong urge to do something shocking.	( )	( )	( )	( )	( )
(9)	I often try to do more than one thing at a time.	( )	( )	( )	( )	( )
(10)	A man should never show his emotions.	( )	( )	( )	( )	( )
(11)	A good philosophy is to grin and bear it.	( )	( )	( )	( )	( )
(12)	Becoming a success is a matter of hard work; luck has little or nothing to do with it.	( )	( )	( )	( )	( )
(13)	One should abandon an activity that he enjoys if friends criticize it.	( )	( )	( )	( )	( )
(14)	It is important to have your work organized and planned before starting it.	( )	( )	( )	( )	( )
(15)	It's not important if you are the very best in a field as long as you are doing the best you can.	( )	( )	( )	( )	( )
(16)	There is a large difference between taking calculated risks and taking chances.	( )	( )	( )	( )	( )
(17)	It is very important to be successful in the things you try to do.	( )	( )	( )	( )	( )

SECTION E - Page 2

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(18) Without the right breaks one cannot attain preferred leadership positions.	( )	( )	( )	( )	( )
(19) When not feeling well one should try to go to work anyway.	( )	( )	( )	( )	( )
(20) It is often better to give in and avoid a fight than to try to have things your own way.	( )	( )	( )	( )	( )
(21) Building furniture and other woodworking activities is a waste of time.	( )	( )	( )	( )	( )
(22) Building model trains, ships, or cars is enjoyable.	( )	( )	( )	( )	( )
(23) I like to paint or make sketches in my spare time.	( )	( )	( )	( )	( )
(24) For most routine car repairs and servicing, I would rather do it myself than take it to a repair shop.	( )	( )	( )	( )	( )
(25) Building electrical equipment like stereos is a satisfying activity.	( )	( )	( )	( )	( )

APPENDIX B: FORWARD OBSERVER QUESTIONNAIRE, INSTRUCTIONS, AND COVER LETTER

DEPARTMENT OF THE ARMY
UNITED STATES ARMY FIELD ARTILLERY SCHOOL
FORT SILL, OKLAHOMA 73503

ATSF-CT

4 January 1979

SUBJECT: Training Requirements for FO Skill Maintenance

1. A research survey is being performed for improvements in FO training and unit skill maintenance. Several study efforts have already been carried out by the Field Artillery School and TRADOC to upgrade FO performance. Recently, the Army Research Institute for Behavioral and Social Science (Fort Sill Field Unit) has initiated a special contract to conduct different phases of investigation to better predict and account for FO behavior. In this latter effort the Institute procured the assistance of the Engineering Psychology Department, McDonnell-Douglas Corporation.

2. Your responses are most earnestly requested to bring this research to a successful conclusion. A necessary sample of officers covering a wide variety of experiences will yield the kind of data to more effectively review our resident instructional courses and materials as well as exportable training products.

3. Your completion of the questionnaire and return through the addressed envelope will be most appreciated and valuable for training advances. Kindly return the questionnaire on or before 9 February 1979.

4. Let us all resolve that improved training and readiness will be achieved in this New Year of 1979.

1 Incl
as

EDWARD A. DINGES
Brigadier General, USA
Assistant Commandant

MCDONNELL DOUGLAS

CORPORATIO

TITLE: Research on Methodology for Selection and Training of Human Target Acquisition Skills: Phase I - Forward Observer

FORWARD OBSERVER QUESTIONNAIRE

INTRODUCTION

McDonnell Douglas Corporation is currently under contract to the U.S. Army Research Institute to conduct research on the selection and training of Artillery Forward Observers (DAHC-19-78-C-0025). As part of this effort, we are conducting a survey of officers who have served as Forward Observers (FOs) or Fire Support Team (FIST) Chiefs, focusing primarily on the traditional FO job. The product of this effort should provide a wealth of information which is useful for selection and training decisions required as the transition to the FIST concept continues.

The enclosed Forward Observer Questionnaire is divided into three sections. The first focuses on rating specific FO tasks, the second includes questions which will augment our efforts to develop a profile of the effective FO, and the third includes questions about the FO job. By completing this questionnaire and returning it in the enclosed envelope, you will provide important information for making improvements in the selection and training of officers and enlisted personnel for critical Artillery Military Occupational Specialities. Additionally, it will be an opportunity for your experience, opinions, and insights to be used by the Army training community.

Your cooperation and prompt attention to this questionnaire is greatly appreciated.

INSTRUCTIONS

SECTION I

This section includes 21 tasks which may be performed by an FO. Rate each task on the six dimensions specified across the top of the page. If additional FO tasks are identified, please fill them in at the end of the task listing (page 2) and rate each on all six dimensions. Any comments regarding the validity of the tasks are to be included in the Remarks column. Each column should be interpreted according to these instructions:

1. Type of Training Needed - Four basic types of training have been identified: (Indicate as many as are appropriate for each task.)

    a) Traditional classroom instruction

    b) Simulators - Devices used both for training procedures and elements of the FO job, e.g., observed fire trainer (OFT).

Saint Louis, Missouri 63166

c) Formal field instruction - This can be thought of as a class-like instructional activity conducted in the field. An example of this is a Gunnery Exercise, presently part of OBC, during which a group of students, under the direction of an instructor, practice adjusting fire.

d) Field exercise - This refers to field exercises during which the individual is performing the task in a manner closest to actual combat conditions, e.g., exercises with the maneuver unit.

2. Effectiveness of Performance - Estimate how well you initially performed each task during your first assignment to a unit as an FO. (Check only one for each task.)

3. Task Difficulty - This is a measure of the relative difficulty involved in performing the task rated on a scale from "not difficult" to "extremely difficult". (Check only one for each task.)

4. Criticality - This is an indication of the seriousness of probable consequences if task is done poorly, delayed too long, not done at all, etc. (Check only one for each task.)

SECTION II

In this section, we present a series of questions about your experience as it relates to the Army and the FO job. Mark the single best answer to each question.

SECTION III

Included in this section are questions about FO training, the FIST concept, and other items pertinent to successful performance of the FO job. Please respond candidly. Room for comments is provided at the end of Section III. We encourage you to include any remarks which would provide the research team with further insight into this study of the forward observer job. Please return the seven page stapled questionnaire to the following address using the enclosed stamped envelope:

Dr. John B. Mocharnuk
Engineering Psychology Department
McDonnell Douglas Astronautics Company - St. Louis
P.O. Box 516
St. Louis, MO 63166

FORWARD OBSERVER QUESTIONNAIRE

DATA REQUIRED BY THE PRIVACY ACT OF 1974
(5 USC 552A)

TITLE OF FORM: Forward Observer Questionnaire, PT5283

PRESCRIBING DIRECTIVE: AR 70-1

AUTHORITY: 10 USC SEC 4503

PRINCIPAL PURPOSE: The data collected with the attached form are to be used for research purposes only.

ROUTINE USES: This is an experimental personnel data collection form developed by the Army Research Institute for the Behavioral and Social Sciences and its contractor pursuant to its research mission as prescribed in AR 70-1. When identifiers (Name and Social Security Number) are requested, they are to be used for administrative and statistical control purposes only. Full confidentiality of the responses will be maintained in the processing of these data.

Your participation in this research is strictly voluntary. Individuals are encouraged to provide complete and accurate information in the interest of the research, but there will be no effect on individuals for not providing all or any part of the information. This notice may be detached from the rest of the form and retained by the individual if so desired.

PT5283

FORWARD OBSERVER QUESTIONNAIRE

Identification Information:

1. Name ______________________________ Rank ______________________

   SSAN No. ______________________

2. Present Work Assignment ____

Experience and Other Job Related Information

1. What was your source of commission? ______________________________

2. When did you complete FAOBC? ____________________________________

3. When did you last serve as an FO or FIST Chief? (Specify Which)_______

   ____

4. How many months have you served as an FO or FIST Chief? (Specify Which)

   ____

SECTION I

	TYPE OF TRAINING NEEDED								EFFECTIVENESS OF PERFORMANCE (FOR FIRST ASSIGNMENT AS FO)					TASK DIFFICULTY					CRITICALITY					REMARKS
	OBC				UNIT				Were you:					(How hard is it to do this task?)					COMBAT ESSENTIAL					
	Classroom	Simulator	Formal Field Instruction	Field Exercise	Classroom	Simulator	Formal Field Instruction	Field Exercise	Ineffective		Moderately Effective		Very Effective	Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult	Not Essential	Slightly Essential	Moderately Essential	Very Essential	Extremely Essential	
1. Use and repair communication equipment	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
2. Determine direction using a compass	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
3. Measure angle using hand and fingers	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
4. Measure angle using binoculars	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
5. Determine distance by flash-bang method	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
6. Determine distance by estimation	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
7. Determine distance by relative appearance of objects	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
8. Prepare and use observed fire fan	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
9. Read and interpret a military map	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
10. Locate points on a map	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
11. Determine self location by terrain association	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
12. Navigate on land on foot	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
13. Navigate on land from vehicle	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
14. Determine target location by terrain association	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
15. Select and occupy observation post	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
16. Recognize and identify target(s)	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	)	( )	( )	( )	( )	( )	( )	( )	
17. Determine target location by polar plot	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	

SECTION I (Continued)

	TYPE OF TRAINING NEEDED: OBC				TYPE OF TRAINING NEEDED: UNIT				EFFECTIVENESS OF PERFORMANCE (FOR FIRST ASSIGNMENT AS FO) Were you:					TASK DIFFICULTY (How hard is it to do this task?)					CRITICALITY: COMBAT ESSENTIAL					REMARKS
	Classroom	Simulator	Formal Field Instruction	Field Exercise	Classroom	Simulator	Formal Field Instruction	Field Exercise	Ineffe		Moderately Effective		Very Effective	Not Difficult	Slightly Difficult	Moderately Difficult	Very Difficult	Extremely Difficult	Not Essential	Slightly Essential	Moderately Essential	Very Essential	Extremely Essential	
18. Determine target location by grid coordinates	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
19. Prepare and transmit call for fire	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
20. Adjust fire	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
21. Report positions to FDC	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
Fill in other FO tasks not already included																								
	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	
	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	( )	

SECTION II

(In this section mark the single best answer for each question by circling the number to the left of your answer.

PART A

(1) In which academic courses did you receive your highest grades?

1. Did not attend college or grades were same in courses
2. Math, physics, chemistry, or engineering
3. Biology or physiology
4. English or journalism
5. Business or commerce
6. Foreign languages.
7. History or political science
8. Psychology or education
9. Some field not mentioned

(2) In the past, how have you reacted to competition?

1. Have done my best in competitive situations
2. Have been unaffected by it
3. Have done all right, but haven't liked it
4. Unfavorably
5. In some unspecified way

(3) When you need to solve a tough work problem, what do you usually do?

1. Sit down and figure it out myself
2. Talk it over with my wife or friends
3. Talk it over with some of the fellows at work
4. Talk it over with my boss or other supervisors
5. Let it ride for a while, then tackle it with a fresh eye
6. Something else or some combination of the above

(4) What was your first branch choice?

1. Artillery
2. Infantry
3. Armor
4. Combat engineer
5. Finance
6. Adjutant General
7. Other noncombat branch

(5) During actual combat a good forward observer is likely to be:

1. Calm
2. Somewhat nervous before and calm during combat
3. Tense and alert at all times
4. Apprehensive but doing his best in spite of it

(6) Most failures to hit the target result from:

1. A breakdown in communications
2. Inadequate performance by the FO
3. Inadequate equipment
4. Errors on the part of the gun crew
5. Errors in the FDC
6. Gun error and weather factors

(Check the appropriate column)

PART B	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
(1) College training has little to do with being a good Artillery Officer.	( )	( )	( )	( )	( )
(2) Training to be an FO in peacetime is:					
A. Of reduced importance since officers spend most of their time performing administrative functions.	( )	( )	( )	( )	( )
B. Important for maintaining combat readiness.	( )	( )	( )	( )	( )
(3) Using common sense as a Forward Observer is as important as following the correct procedures.	( )	( )	( )	( )	( )
(4) The difference between hitting the target with the first round and missing it is often a matter of luck.	( )	( )	( )	( )	( )
(5) To progress as an Artillery Officer you do not have to be an above average FO.	( )	( )	( )	( )	( )
(6) The job of the FO cannot be taught in the classroom alone. It requires on-the-job training.	( )	( )	( )	( )	( )

SECTION III

(1) What are the most important skills and abilities a recent FAOBC graduate needs to effectively perform FO component tasks of the FIST Chief job?

(2) Of these important skills and abilities, which are performed best?

Which are performed most poorly?

(3) How could training be changed to improve performance of the FO/FIST Chief skills and abilities?

(4) When you completed your precommission training, were you adequately prepared for FAOBC training?

If not, what skills were you lacking?

Were you readily able to overcome these deficiencies?

If so, how?

(5) What personal characteristics are necessary for an individual to become a good FO?

(6) Comments:

PLEASE RETURN ONLY THE QUESTIONNAIRE

APPENDIX C: PREDICTION MODELS BUILT ON OBC 1-79 DATA

Appendix C. Prediction Models Built On OBC 1-79 Data

In order to observe patterns in the data, the same predictors which were included in equations 1 and 2 of Section 2 were examined in models constructed independently on data from OBC 1-79. These models are included to provide additional information about the set of predictors examined. The two models using the GØ-0211 grade criterion take essentially the same form as those in Equations 1 and 2 and are summarized in Tables C-1 and C-2 respectively. Three variables which resulted from the failure of some OBC 12-78 students to respond to certain items were not needed for the OBC 1-79 class, so three variables, 5, 12, and 21, which were included in the OBC 12-78 models were not included in the regressions summarized in Tables C-1 and C-2.

Comparing the 15 element models built on OBC 12-78 data with those built on OBC 1-79 data one may note that three predictors continue to have strong effects in the original direction. They are the STEP score, the proxy for math ability; the sports score; and item D3, being an FO is a rewarding experience. The Boy Scout factor and the urban-suburban-rural items did not show effects in the model built on the OBC 1-79 data. Two possible explanations for this change are tenable. First, OBC 1-79 appeared to be a more homogeneous sample than OBC 12-78; that is, OBC 12-78 had some very poor students and a few outstanding students whereas OBC 1-79, even with its variety of students, did not have the extremes (especially at the low end) which were present in OBC 12-78. The second possible explanation for this difference related to the composition of the GØ-0211 grade and its possible interaction with other factors. In general, the OBC 1-79 scores on this observed fire grade were lower. The mean for the sample of OBC 12-78 on GØ-0211 was 83.25, and for OBC 1-79 it was 79.39. It is conceivable that colder weather during OBC 1-79 may have impaired firing performance. This is supported by comments from Gunnery Department Basic Branch Instructors. It is also consistent with performance patterns highlighted in discussions with members of the WSTEA-I research team.

TABLE C-1

SUMMARY OF THE MULTIPLE REGRESSION OF GØ-0211
ON A SET OF PREDICTOR VARIABLES REPRESENTING
15 VARIABLE CATEGORIES: OBC 1-79

	VARIABLE DESCRIPTION		$\hat{\beta}$	r AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
	STEP	X_1	.1426	29.48	9.99	.1870	.1870
	SPORTS	X_2	1.3478	10.30	9.98	.0653	.2523
B4	URBAN	X_3	.9465				
B4	SUBURBAN	X_4	.02967	0.23	.64	.0029	.2552
B4	(RURAL)		0.0				
A3	NO RESPONSE	X_5					
A3	TENDERFOOT OR SECOND CLASS	X_6	1.0791				
A3	FIRST CLASS	X_7	-1.2307	0.23	.53	.0057	.2609
A3	STAR OR LIFE	X_8	-1.5092				
A3	EAGLE	X_9	-1.1821				
A3	(NO BOY SCOUTS)		0.0				
	D3	X_{10}	-1.4271	5.59	4.63	.0355	.2964
	E2	X_{11}	0.7761	0.58	1.07	.0037	.3001
B25	NO RESPONSE	X_{12}					
B25	NO SINGLE AREA	X_{13}	2.9994				
B25	MATH - SCIENCE - ENGR	X_{14}	0.3562				
B25	BIOLOGY - PHYSIOLOGY	X_{15}	-0.6507				
B25	ENGLISH - JOURNALISM	X_{16}	-0.5757	0.27	.30	.0138	.3139
B25	BUSINESS	X_{17}	-0.5606				
B25	FOREIGN LANGUAGE	X_{18}	3.6507				
B25	HISTORY - POLITICAL SCIENCE	X_{19}	-0.7827				
B25	PSYCHOLOGY - EDUCATION	X_{20}	-0.8535				
B25	(OTHER)		0.0				
C8	NO RESPONSE	X_{21}					
C8	OTHER THAN REFERENCE	X_{22}	.9611	0.12	.59	.0008	.3147
C8	(INADEQUATE PERFORMANCE BY FO)		0.0				
	D5	X_{23}	.0149	0.03	0.00	.0002	.3149
	D11	X_{24}	-0.4927	0.78	.67	.0049	.3198
	D16	X_{25}	-0.3537	0.43	.21	.0027	.3225
	D10	X_{26}	-0.0365	0.00	0.00	.0000	.3225
	E5	X_{27}	0.0587	0.12	.01	.0008	.3233
	E10	X_{28}	-0.9270	2.19	2.33	.0139	.3372
C2	ARTILLERY	X_{29}	0.9219	0.47	.47	.0030	.3402
C2	(OTHER)		0.0				
	INTERCEPT		39.2991				

TABLE C-2

SUMMARY OF THE MULTIPLE REGRESSION OF GØ-0211
ON A SET OF PREDICTOR VARIABLES REPRESENTING
16 VARIABLE CATEGORIES: OBC 1-79

	VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
	STEP	X_1	.1[illegible]92	29.96	6.44	.1870	.1870
	SPORTS	X_2	1.3[illegible]30	10.47	9.76	.0739	.2609
B4	URBAN	X_3	1.7444				
B4	SUBURBAN	X_4	-0.1418	0.23	.58	.0029	.2638
B4	(RURAL)		0.0				
A3	NO RESPONSE	X_5					
A3	TENDERFOOT OR SECOND CLASS	X_6	1.1984				
A3	FIRST CLASS	X_7	-1.2878	0.23	.58	.0057	.2695
A3	STAR OR LIFE	X_8	-1.5435				
A3	EAGLE	X_9	-1.0380				
A3	(NO BOY SCOUTS)		0.0				
	D3	X_{10}	-1.0830	5.68	2.46	.0355	.3050
	E2	X_{11}	.9200	0.59	1.51	.0037	.3087
B25	NO RESPONSE	X_{12}					
B25	NO SINGLE AREA	X_{13}	4.1237				
B25	MATH - SCIENCE - ENGR	X_{14}	0.1509				
B25	BIOLOGY - PHYSIOLOGY	X_{15}	-0.8422				
B25	ENGLISH - JOURNALISM	X_{16}	-0.8597	0.28	.44	.0138	.3225
B25	BUSINESS	X_{17}	-0.7649				
B25	FOREIGN LANGUAGE	X_{18}	3.66				
B25	HISTORY - POLITICAL SCIENCE	X_{19}	-0.6626				
B25	PSYCHOLOGY - EDUCATION	X_{20}	-1.4130				
B25	(OTHER)		0.0				
C8	NO RESPONSE	X_{21}					
C8	OTHER THAN REFERENCE	X_{22}	0.8627	0.12	.49	.0008	.3233
C8	(INADEQUATE PERFORMANCE BY FO)		0.0				
	D5	X_{23}	.05586	0.03	.01	.0002	.3235
	D11	X_{24}	-0.4957	0.80	.69	.0049	.3284
	D16	X_{25}	-0.6342	0.44	.66	.0027	.3311
	D10	X_{26}	-0.0782	0.00	.02	.0000	.3311
	E5	X_{27}	0.0314	0.12	0.0	.0008	.3319
	E10	X_{28}	-0.7549	2.23	1.53	.0139	.3458
C2	ARTILLERY	X_{29}	.7741	0.47	.33	0.47	.3928
C2	(OTHER)						
	AA-0201	X_{30}	.0988	2.71	2.71		
	INTERCEPT		37.6166				

Three and four element models containing the most influential variables from the OBC 12-79 model building activity were created for the OBC 1-79 data. These models are summarized in Figures C-3 and C-4, respectively. No substantial deviations from OBC 12-78 models were noted for the reduced variable set models constructed using OBC 1-79 data.

Four corresponding models of OBC 1-79 Final Grade were constructed and are summarized in Tables C-5, C-6, C-7, and C-8. Two of the models built on OBC 1-79 data were cross validated on the OBC 12-78 data and held up well. This can be seen in the summary table (Table 2-19) shown in Section 2.

TABLE C-3

SUMMARY OF THE MULTIPLE REGRESSION OF GØ-0211
ON THREE PREDICTORS: OBC 1-79

VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
STEP	X_1	0.1780	43.93	30.75	.2060	.2060
SPORTS	X_2	1.1093	10.64	10.53	.0499	.2559
D3	X_3	-1.0688	4.71	4.71	.0221	.2780
INTERCEPT		26.6786				

TABLE C-4

SUMMARY OF THE MULTIPLE REGRESSION OF GØ-0211
ON FOUR PREDICTOR VARIABLES: OBC 1-79

VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
STEP	X_1	0.1465	37.90	16.34	.1939	.1939
SPORTS	X_2	1.2194	11.24	11.48	.0575	.2514
D3	X_3	-1.2241	7.59	4.95	.0388	.2902
AA-0201	X_4	0.0668	1.77	1.77	.0091	.2993
INTERCEPT		30.8594				

TABLE C-5

SUMMARY OF THE MULTIPLE REGRESSION OF OBC FINAL GRADE ON A SET OF PREDICTOR VARIABLES REPRESENTING 15 VARIABLE CATEGORIES: OBC 1-79

	VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
	STEP	X_1	.2552	78.88	39.59	.3668	.3668
	SPORTS	X_2	.3678	1.02	.92	.0047	.3715
B4	URBAN	X_3	.4887				
B4	SUBURBAN	X_4	-1.2584	0.03	.83	.0003	.3718
B4	(RURAL)		0.0				
A3	NO RESPONSE	X_5					
A3	TENDERFOOT OR SECOND CLASS	X_6	.1089				
A3	FIRST CLASS	X_7	-1.6826	0.42	.41	.0076	.3794
A3	STAR OR LIFE	X_8	-0.9743				
A3	EAGLE	X_9	-1.3741				
A3	(NO BOY SCOUTS)		0.0				
	D3	X_{10}	-.9873	4.13	2.81	.0192	.3986
	E2	X_{11}	.9596	2.68	2.02	.0125	.4111
B25	NO RESPONSE	X_{12}					
B25	NO SINGLE AREA	X_{13}	1.7483				
B25	MATH - SCIENCE - ENGR	X_{14}	-2.7707				
B25	BIOLOGY - PHYSIOLOGY	X_{15}	1.3837				
B25	ENGLISH - JOURNALISM	X_{16}	-1.7490	1.38	1.59	.0515	.4625
B25	BUSINESS	X_{17}	-4.0411				
B25	FOREIGN LANGUAGE	X_{18}	-4.4374				
B25	HISTORY - POLITICAL SCIENCE	X_{19}	-2.4963				
B25	PSYCHOLOGY - EDUCATION	X_{20}	1.2817				
B25	(OTHER)		0.0				
C8	NO RESPONSE	X_{21}					
C8	OTHER THAN REFERENCE	X_{22}	-.4069	1.13	.13	.0053	.4679
C8	(INADEQUATE PERFORMANCE BY FO)		0.0				
	D5	X_{23}	1.3517	2.76	4.43	.0128	.4807
	D11	X_{24}	-1.0799	4.09	3.97	.0190	.4997
	D16	X_{25}	0.4003	0.13	.34	.0006	.5003
	D10	X_{26}	-.3515	0.49	.49	.0023	.5026
	E5	X_{27}	.0173	0.07	0.0	.0003	.5029
	E10	X_{28}	-.6791	1.43	1.55	.0067	.5096
C2	ARTILLERY	X_{29}	.7969	0.44	0.44	.0020	.5116
C2	(OTHER)		0.0				
	INTERCEPT		11.6980				

TABLE C-6

SUMMARY OF THE MULTIPLE REGRESSION OF OBC FINAL GRADE ON A SET OF PREDICTOR VARIABLES REPRESENTING 16 VARIABLE CATEGORIES: OBC 1-79

	VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
	STEP	X_1	.2059	90.43	26.75	.366	.366
	SPORTS	X_2	.3090	1.17	0.74	.005	.371
B4	URBAN	X_3	.1402				
B4	SUBURBAN	X_4	-1.5573	0.04	1.18	.000	.371
B4	(RURAL)		0.0				
A3	NO RESPONSE	X_5					
A3	TENDERFOOT OR SECOND CLASS	X_6	.3808				
A3	FIRST CLASS	X_7	-1.7776	0.48	0.53	.008	.379
A3	STAR OR LIFE	X_8	-1.0209				
A3	EAGLE	X_9	-1.0462				
A3	(NO BOY SCOUTS)		0.0				
	D3	X_{10}	-.3038	4.73	0.28	.019	.398
	E2	X_{11}	1.2641	3.07	3.96	.012	.410
B25	NO RESPONSE	X_{12}					
B25	NO SINGLE AREA	X_{13}	4.0657				
B25	MATH - SCIENCE - ENGR	X_{14}	-3.2242				
B25	BIOLOGY - PHYSIOLOGY	X_{15}	0.9807				
B25	ENGLISH - JOURNALISM	X_{16}	-2.5601	1.59	2.18	.051	.461
B25	BUSINESS	X_{17}	-4.4816				
B25	FOREIGN LANGUAGE	X_{18}	-4.4588				
B25	HISTORY - POLITICAL SCIENCE	X_{19}	-2.2991				
B25	PSYCHOLOGY - EDUCATION	X_{20}	.1097				
B25	(OTHER)		0.0				
C8	NO RESPONSE	X_{21}					
C8	OTHER THAN REFERENCE	X_{22}	-.5815	1.30	0.31	.005	.466
C8	(INADEQUATE PERFORMANCE BY FC)		0.0				
	D5	X_{23}	1.4799	3.16	6.07	.013	.479
	D11	X_{24}	-1.0908	4.69	4.64	.019	.498
	D16	X_{25}	-.1648	0.15	0.06	.001	.499
	D10	X_{26}	-.4307	0.56	0.85	.002	.501
	E5	X_{27}	-.0663	0.08	0.01	.003	.504
	E10	X_{28}	-.3221	1.64	0.39	.007	.511
C2	ARTILLERY	X_{29}	.4395	0.50	.15	.002	.513
C2	(OTHER)		0.0				
	AA-0201	X_{30}	.2050	16.37	16.37	.066	.579
	INTERCEPT		8.3893				

TABLE C-7

SUMMARY OF THE MULTIPLE REGRESSION OF OBC FINAL GRADE ON THREE PREDICTORS: OBC 1-79

VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
STEP	X_1	.2693	92.81	73.37	.3607	.3607
SPORTS	X_2	.5579	2.81	2.78	.0109	.3716
D3	X_3	-1.2387	6.71	6.71	.0261	.3977
INTERCEPT		7.6608				

TABLE C-8

SUMMARY OF THE MULTIPLE REGRESSION OF OBC FINAL GRADE ON FOUR PREDICTOR VARIABLES: OBC 1-79

VARIABLE DESCRIPTION		$\hat{\beta}$	F AT ENTRY	F	INCREASE IN R^2	MULTIPLE R^2
STEP	X_1	0.2182	88.22	41.57	0.3688	.3688
SPORTS	X_2	0.3929	1.37	1.35	0.0057	.3745
D3	X_3	-0.3800	3.26	0.53	0.0136	.3881
AA-0201	X_4	0.1724	13.27	13.27	0.0555	.4436
INTERCEPT		7.4313				

APPENDIX D: TASK LISTS DEVELOPED FROM OBC TEXTS

TABLE D-1
TASK LIST BASED ON FM 6-40

1. Plot target using grid procedures
2. Acquire targets
3. Adjustment of fires when necessary
4. Surveillance of fire for effect
5. Battlefield surveillance
6. Must report everything they observe
7. Fire missions have priority
8. Check his equipment
9. Report to the proper personnel for briefing
10. Brief his section
11. Make a map reconnaissance
12. Check communications
13. Orient map
14. Plot those points which are at known locations
15. Report his position to fire direction center
16. Report field of observation to the fire direction center
17. Prepare an observed fire fan
18. Prepare a terrain sketch
19. Prepare target location data for probable target positions
20. Establish grid azimuth
21. Orient self for direction
22. Establish grid azimuth to reveal sharply defined terrain features
23. Use a declinated magnetic compass
24. Plot self position
25. Determine direction using horizontal mil scale in binoculars and known references
26. Use gun-target line for tank-mounted observing
27. Use a cardinal direction (tank-mounted observing)
28. Locate known points using maps
29. Locate known points by survey
30. Locate known points by firing
31. Create visibility diagram
32. Mark points of importance not printed on a map
33. Mark reference points on map
34. Mark registration points on map
35. Mark likely points of enemy activity on map
36. Use an observed fire fan
37. Create a terrain sketch
38. Use terrain sketch to orient your relief
39. Prepare a visibility diagram
40. Use a visibility diagram prepared by FDC personnel
41. Identify blind spots on a visibility diagram
42. Locate target by grid coordinates
43. Locate target by shift from known point
44. Locate target by polar coordinates
45. Determine distance by estimation
46. Determine distance by computation

47. Use ranging rounds
48. Establish a known distance in the target area using a map or photograph
49. Approximate distance from self to sound source
50. Compute a distance by applying the mil relation
51. Measure angle using field glasses
52. Measure angle using aiming circle
53. Measure angle using battery commanders periscope
54. Measure angle using hand and finger method
55. Determine own position
56. Determine azimuth to the target
57. Determine grid coordinates by use of a coordinate scale
58. Determine grid coordinates by estimation
59. Determine grid coordinates by relating the target location to a known terrain feature marked on the map
60. Locate a target by a shift from a known point
61. Measure the angular deviation from a reference point to the target and applying the measured deviation to the direction from his position to the reference point
62. Complete a horizontal shift (lateral shift, range shift)
63. Use mil relation for computing the lateral shift
64. Use the sine factor
65. Call for marking rounds
66. Orient yourself
67. Use standardized terminology
68. Use read-back method of radiotelephone transmission
69. Specify method of fire and method of control
70. Describe target
71. Specify method of engagement
72. Specify call for fire for
    - o registration using surveyed chart
    - o area mission using polar plot
    - o destruction mission using shift from a known point
    - o area mission using prearranged data
    - o area mission firing high-angle fire
73. Announce spottings as they occur for various fire types
74. Call an area fire for effect after adjustment
75. Report observed effects
76. Know how to use HC smoke
77. Know how to use colored smoke
78. Know how to use white phosphorus
79. Know how to use gas
80. Evaluate atmospheric turbulence for chemical projectiles
81. Evaluate wind factors for chemical projectiles
82. Select adjusting points by assessing
    - o area to be blinded
    - o area to be screened
    - o wind direction
83. Conduct a Quick Smoke Mission
84. Conduct an illumination mission
85. Use "at my command"
86. Use illumination for HE adjustment (coordinate adjustment of both types of rounds simultaneously)

87. Adjust searchlight using beam-width
88. Conduct assault fire controlling and ending
89. Use combined observation in daylight
90. Use combined observation at night
91. Conduct a high-burst registration mission with combined observation
92. Conduct a mean point of impact registration mission with combined observation
93. Determine whether high-angle fire is required
94. Adjust on an auxiliary adjusting point
95. Conduct fire when observer is not oriented (using gun-target line)
96. Adjust using sound alone
97. Use ABCA precision fire procedures
98. Bring fire on a moving target
99. Select intercept points (IP)
100. Determine distance between successive intercept points
101. Determine target rate of movement
102. Assist in the creation of an observed firing chart

TABLE D-2
TASK LIST ON MAP READING FROM FM 21-26

1. Identify features on a map
2. Specify military symbols and abbreviations
3. Use a uniform and precise system of referencing
4. Determine angular distance between 2 lines
5. Locate a point on map using geographic coordinates
6. Recognize foreign prime meridians
7. Use the U.S. military grid reference system
8. Plot grid coordinates
9. Use a coordinate scale for determination of coordinates
10. Designate a point by RIGHT-UP
11. Identify and write coordinates
12. Use a map with more than one grid (junctions and overlaps)
13. Use British grid as secondary grid
14. Use the World Geographic Reference (GEOREF) system
15. Use authorized numeral code for encrypting map references and other numeral information
16. Express location of object using thrust line system
17. Use representative fraction (RF) as a scale for determining ground distance
18. Determine RF from comparison with ground distance
19. Determine RF by comparison with another map of the same area that has an RF
20. Determine ground distance using graphic (bar) scales for straight lines and curved lines
21. Determine road distance from a point on map to a point off the map
22. Measure road distances in miles and/or kilometers
23. Determine time required to travel distance on ground
24. Construct time-distance scale showing length of march, rate of speed, and map scale
25. Convert English units of linear measurement into metric units and visa versa
26. Use degrees, seconds, and minutes as angular measurements
27. Use mil as angular measurement
28. Use grad as angular measurement
29. Establish base or reference lines
30. Identify magnetic, true, and grid north from compass and military map
31. Express direction using azimuths
32. Convert from magnetic azimuth to grid azimuth and visa versa using declination diagram
33. Orient map using declination diagram
34. Give a bearing from knowing the reference line, amount of angle, and direction
35. Convert bearings to azimuths and visa versa
36. Measure bearings and azimuths from magnetic, grid, or true north lines

37. Use magnetic compasses (lensatic and artillery) for measuring directions and angles in field
38. Orient map by use of compass and ground features
39. Use protractor to determine grid azimuth of a line from one point to another on a map and to plot a direction line from a known point on a map
40. Establish grid direction line on map
41. Utilize intersection by map and compass method and straightedge method
42. Do resection with and without compass (straightedge)
43. Locate a distant point by one line
44. Locate user's position by one line
45. Determine directions using field expedients: shadow-tip method, equal shadow method, stars, and a watch
46. Determine present location by dead reckoning
47. Record all data and plot all positions
48. Measure distance using pace
49. Measure distance using odometer
50. Navigate using steering marks by day and night
51. Navigate while in vehicle
52. Plot march on face of map
53. Determine deliberate offset when approaching a linear feature
54. Bypass enemy positions and obstacles and remain oriented
55. Navigate from map
56. Determine elevation of all terrain features
57. Indicate and determine elevation by use of contour lines
58. Determine and interpret slope as gradient, percent, and degrees
59. Estimate and interpret elevation
60. Use bench marks and spot elevations to indicate points of known elevation on map
61. Identify and describe features using contour lines
62. Sketch land formations
63. Develop profile of surface area for determining visibility, and for plotting hidden areas
64. Depict relief by layer tinting, form lines, shading and hachures on a map
65. Prepare map and aerial photograph
66. Use an aerial photograph as a map overlay supplement or substitute
67. Discriminate between and utilize vertical, low oblique, high oblique, trimetrogon, multiple lens, convergent, and panoramic photographs
68. Identify artificial camouflage materials from infrared and camouflage detection photographs
69. Use standard titling data for aerial photographs and sketches
70. Determine representative fraction (RF) for aerial photographs by comparison method and focal length flight altitude method
71. Prepare index for all maps by four corner method and template method
72. Orient photograph with map when available
73. Orient photograph to surrounding ground features by inspection
74. Use point designation grid to designate points on photographs
75. Construct a grid on a photograph

76. Identify features on a pair of aerial photographs using pocket and mirror stereoscopes
77. Identify features on a photograph
78. Assemble mosaics from aerial photographs to form pictorial representation of planimetry of an area only
79. Use photomap and pictomap as map substitute and supplement
80. Make road and area sketches
81. Determine scale of sketch
82. Use triangular alidade, sketching board, and clinometer to make sketch
83. Use a control to determine distances, directions, or differences in elevation between points on a sketch
84. Establish control for sketch by using traversing
85. Detail sketch in accordance with its purpose
86. Make a panoramic sketch of the terrain in elevation and perspective
87. Improvise mil rule to measure deflections
88. Select a conspicuous and permanent reference point in the area to be sketched
89. Devise map reference for sketch
90. Include all necessary data with sketch

TABLE D-3
TASK LIST BASED ON SPECIAL MISSIONS-FIRE DIRECTION AND FORWARD OBSERVER PROCEDURES

1. Determine and conduct initial and subsequent firing data for the following missions:
   a. Improved conventional munitions
   b. Illuminating projectile
   c. Projectile weight corrections
   d. Hasty fire plan
   e. Suppression
   f. Massing of fires
   g. Air observer missions
   h. Multiple missions
   i. Delay fuze
   j. Missions from untrained observers
   k. Attack of moving targets
   l. Special observer techniques
2. Employ Improved Conventional Munitions (ICM) to provide support to the maneuver element and against targets
3. Advise the maneuver commander on the effects of ICM
4. Report malfunctions (duds) of ICM to the supported maneuver unit
5. Call for fire using the following procedures:
   a. Transfer (FFE) using current HE corrections
   b. Adjustment with HE and firing ICM in effect
   c. Adjustment with ICM
6. Call for fire for effect with adjustment
7. Adjust with HE to a point near the target and make a BOLD SHIFT TO FIRE FOR EFFECT on the target
8. Adjust range and deviation from the center of the effects pattern
9. Make a BOLD SHIFT from the center of the initial pattern and FIRE FOR EFFECT
10. Give an UP correction for duds and small patterns
11. Start adjustment at least 600 meters from friendly troops when adjusting close-in fires with ICM
12. Make adjustment with entire battery
13. Make corrections from the NEAR EDGE OF THE EFFECTS PATTERN
14. Compute firing data for ICM using the graphic method when the normal HE graphical table is modified
15. Compute firing data for ICM using the proper tabular firing table
16. Determine fuze setting (M564), deflection, and HE (Fuze Quick) quadrant elevation using the announced chart range and deflection
17. Determine ICM firing data using Fuze Setting M565, Deflection, Quadrant Elevation, and subsequent corrections
18. Record firing data
19. Illuminate areas of suspected enemy activity
20. Provide illumination for night adjustment or surveillance of artillery fire by air or ground observers
21. Provide illumination for furnishing direction to friendly troops for attacks or patrol activities

22. Adjust range and deviation of illumination
23. Determine height of burst corrections for flares
24. Adjust the illuminating fire and the HE fire concurrently
25. Control the rate of fire and number of pieces firing
26. Notify the FDC of the exact time when the target is best illuminated
27. Fire-for-effect with white phosphorus and adjust with high explosive (HE), fuze quick
28. Determine correction when a change is made from HE to WP
29. Determine the differences in the weights (squares) of HE and WP
30. Determine the correction for an increase in projectile weight of 1 square
31. Apply the correction to the fire-for-effect chart range
32. Determine drift
33. Develop a hasty fire plan using the GRIDDED THRUST LINE SYSTEM
34. Prepare and transmit the hasty fire plan
35. Identify likely suppressive fire targets and indicate those targets that have priority
36. Assign target numbers
37. Label the gridded template
38. Authenticate codes
39. Send checkpoint/target locations
40. Call for planned and immediate suppression fires
41. Identify observer to FDC
42. State warning order
43. Send target location as the target/checkpoint identification
44. Locate targets by grid or shift from a preplanned target/checkpoint
45. Terminate suppressive fires
46. Use TIME ON TARGET techniques
47. Transmit 2 or more calls for fire and adjust all simultaneously
48. Determine which of several targets should be engaged first
49. Record the corrections determined for each target
50. Request ricochet fire and fuze delay
51. Select Intercept Points (IP) when firing on moving targets
52. Determine the distance between each IP
53. Determine when to command fire on IP's
54. Adjust fire on IP's
55. Adjust fire by the use of sound alone
56. Determine target location by sound
57. Alert FDC that observer is adjusting by sound
58. Use creeping techniques to adjust onto the target
59. Adjust fire on a point near the target (the auxiliary adjusting point)
60. Call for marking rounds
61. Use point of burst as a known point from which shifts can be made to subsequent targets
62. Record enemy locations, coordinating measures, and other critical areas on the map
63. Determine and use the following spotting lines on an aerial mission:
    a. Gun-target line (GT)
    b. Observer-target line (OT)
    c. Cardinal direction
    d. Readily identifiable terrain feature
64. Adjust fire on an aerial mission by stationary hover and popup
65. Adjust artillery as an AO at night using night vision goggles (AN/PVS-5)

TABLE D-4
TASK LIST BASED ON FM 6-120
(FIELD ARTILLERY TARGET ACQUISITION)

1. Chief flash observer - (a) supervises work of flash observers to insure that the OP's of the flash base are installed properly; (b) informs flash observers of friendly and enemy positions
2. Locate points in the target area by flash ranging
3. Report azimuth to the plotting center
4. Notify all adjacent troops before climbing trees
5. Accompany reconnaissance patrols to locate targets
6. Maintain current and accurate situation maps, both friendly and enemy

TABLE D-5
TASK LIST BASED ON FM 6-121
(FIELD ARTILLERY TARGET ACQUISITION)

1. Meet position requirements by map inspection an/or estimation
2. Determine direction by compass and/or map inspection
3. Request fire support on targets in the supported company's zone of action
4. Collect general battlefield information
5. Establish observation post (OP)
6. Prepare visibility diagrams for OP
7. Submit visibility diagrams to the liaison officer

APPENDIX E: SUMMARY DATA FROM FORWARD OBSERVER TASK ANALYSIS FORM

TA
FORWARD OBSERVER T
(CELL ENTRI

	FREQUENCY OF PERFORMANCE DURING COMBAT EXERCISE						TIME BETWEEN JOB ENTRY AND FIRST TIME PERFORMED						TASK DIFFIC			
	NEVER	INFREQUENTLY	OCCASSIONALLY	OFTEN	VERY OFTEN	NO RESPONSE	NOT YET PERFORMED	MORE THAN TWO YEARS	BETWEEN ONE-TWO YEARS	BETWEEN 6 MOS-ONE YEAR	DURING FIRST SIX MONTHS	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICUL
1. DECLINATE AN M2 COMPASS	.30	.36	.20	.07	.07	.0	.25	0	.04	.12	.59	0	.84	.14	.02	0
2. DETERMINE DIRECTION USING AN M2 COMPASS.	.05	.07	.09	.29	.50	0	.04	.02	0	.02	.93	0	.82	.14	.04	0
3. DETERMINE DIRECTION USING BINOCULARS AND KNOWN REFERENCES.	.14	.04	.12	.30	.39	0	.09	0	0	.05	.86	0	.68	.14	.16	0
4. CONDUCT A TERRAIN ANALYSIS.	.04	.05	.05	.16	.69	0	.02	.04	.02	.02	.89	.02	.45	.36	.20	0
5. READ A MILITARY MAP.	.04	0	0	0	.96	0	0	.02	0	0	.98	0	.55	.29	.12	0
6. ORIENT A MAP USING A COMPASS.	.07	.14	.20	.25	.34	0	.02	.04	.02	.04	.89	0	.84	.12	.04	0
7. ORIENT A MAP BY TERRAIN ASSOCIATION.	.02	.02	.09	.27	.61	0	.02	.04	0	.04	.91	0	.43	.32	.23	.0
8. DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION.	.02	0	.11	.20	.68	0	.04	.04	.02	.05	.86	0	.14	.07	.09	.0
9. LOCATE AN UNKNOWN POINT ON A MAP BY RESECTION.	.12	.38	.32	.05	.12	0	.20	.04	.05	.18	.54	0	.55	.30	.12	.0
10. LOCATE POINTS USING A SURVEY.	.45	.23	.20	.04	.09	0	.46	.07	.02	.10	.34	0	.38	.30	.20	.0
11. MEASURE GROUND DISTANCES ON A MAP.	.05	.05	.18	.25	.46	0	.05	0	0	.04	.89	.02	.82	.16	.02	0
12. LOCATE AN UNKNOWN POINT ON A MAP BY INTERSECTION.	.25	.30	.25	.07	.12	0	.36	.02	.02	.14	.45	.02	.55	.39	.04	0
13. MAKE A MAP RECONNAISANCE.	.02	0	.16	.34	.46	0	.04	.04	0	.07	.84	.02	.59	.25	.14	.0
14. PREPARE AND USE A TERRAIN SKETCH.	.05	.16	.20	.23	.36	0	.07	0	.05	.10	.75	.02	.61	.32	.07	0
15. USE AN FDC PREPARED VISIBILITY DIAGRAM.	.61	.21	.09	.02	.04	.04	.66	.02	.04	.09	.18	.02	.43	.25	.20	.0
16. CONSTRUCT A VISIBILITY DIAGRAM.	.32	.25	.16	.18	.09	0	.30	.02	0	.12	.55	0	.45	.23	.21	.0
17. PREPARE AND USE AN OBSERVED FIRE FAN.	.11	.09	.12	.20	.48	0	.07	.02	0	.07	.84	0	.79	.18	.04	0
18. USE PHOTOGRAPHS, PHOTOMAPS OR PICTOMAPS AS A MAP SUBSTITUTE OR SUPPLEMENT.	.54	.20	.03	.14	.04	.02	.61	.05	.02	.11	.20	.02	.27	.36	.23	.0
19. NAVIGATE ON LAND BY FOOT.	.12	.23	.18	.14	.30	.02	.11	0	.05	.11	.73	0	.41	.34	.23	0

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

LE C-1
SK ANALYSIS SUMMARY DATA*
S ARE PERCENTAGES)

ITY		TRAINING DIFFICULTY						CRITICALITY: CONSEQUENCES OF INADEQUATE PERFORMANCE						CRITICALITY: COMBAT ESSENTIAL					
EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE
0	0	.82	.14	.04	0	0	0	.07	.30	.41	.12	.07	.02	.04	.30	.29	.21	.14	.02
0	0	.80	.14	.05	0	0	0	.02	.12	.07	.45	.34	0	0	.09	.12	.30	.48	0
0	.02	.50	.30	.14	.02	0	.04	.02	.21	.29	.29	.16	.04	.02	.14	.23	.36	.21	.04
0	0	.18	.34	.30	.09	.05	.04	.02	.05	.30	.23	.36	.04	.02	.04	.18	.25	.48	.04
0	.04	.25	.30	.36	.05	.02	.02	0	.02	.04	.18	.75	.02	.02	.02	.02	.07	.86	.02
0	0	.73	.20	.07	0	0	0	.04	.12	.30	.32	.21	0	.05	.14	.27	.27	.27	0
0	0	.25	.38	.32	.04	.02	0	.02	.11	.23	.36	.27	.02	.02	.07	.16	.23	.50	.02
.68	0	.36	.36	.23	.05	0	0	.02	.02	.21	.29	.46	0	.02	.04	.14	.25	.55	0
0	0	.43	.29	.25	.02	.02	0	.11	.23	.34	.23	.09	0	.09	.14	.45	.16	.16	0
.04	.05	.16	.30	.34	.11	.04	.05	.09	.34	.21	.18	.14	.04	.14	.16	.38	.18	.14	0
0	0	.71	.20	.09	0	0	0	.05	.20	.34	.34	.07	0	.02	.18	.25	.30	.23	.02
0	.02	.45	.38	.12	.02	0	.04	.12	.21	.38	.18	.07	.02	.12	.14	.36	.20	.14	.04
0	0	.34	.36	.29	.02	0	0	.04	.12	.21	.41	.21	0	.02	.05	.18	.45	.29	.02
0	0	.43	.39	.16	.02	0	0	.11	.30	.34	.12	.12	0	.05	.32	.27	.12	.21	.02
0	.09	.32	.29	.25	.07	0	.07	.25	.29	.21	.14	.05	.05	.27	.30	.16	.11	.09	.07
0	.02	.27	.34	.27	.09	.02	0	.18	.43	.23	.14	.02	0	.16	.34	.16	.25	.05	.04
0	0	.64	.27	.05	0	.02	.02	.07	.11	.29	.30	.21	.02	.09	.18	.20	.20	.30	.04
0	.09	.12	.34	.34	.09	.02	.09	.04	.29	.29	.18	.07	.12	.07	.20	.21	.30	.11	.11
0	.02	.18	.27	.41	.09	.02	.04	0	.11	.14	.30	.43	.02	0	.07	.09	.29	.54	.02

FORWARD OBSERV
(CELL E

	FREQUENCY OF PERFORMANCE DURING COMBAT EXERCISE						TIME BETWEEN JOB ENTRY AND FIRST TIME PERFORMED						TASK DI		
	NEVER	INFREQUENTLY	OCCASSIONALLY	OFTEN	VERY OFTEN	NO RESPONSE	NOT YET PERFORMED	MORE THAN TWO YEARS	BETWEEN ONE-TWO YEARS	BETWEEN 6 MOS-ONE YEAR	DURING FIRST SIX MONTHS	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT
20. NAVIGATE ON LAND FROM A VEHICLE.	.11	0	.11	.11	.66	.02	.12	0	.02	.09	.77	0	.41	.25	.21
21. NAVIGATE ON LAND WITHOUT ANY AIDS SUCH AS A MAP OR COMPASS.	.50	.29	.14	.04	.04	0	.59	.05	.02	.11	.23	0	.12	.11	.36
22. SELECT AND OCCUPY OBSER-VATION POSTS.	.12	.09	.05	.20	.54	0	.20	0	.02	.07	.69	.02	.55	.23	.16
23. OBSERVE FROM A TANK-MOUNTED POSITION.	.41	.36	.05	.11	.05	.02	.48	.02	.09	.11	.29	.02	.36	.29	.21
24. ACQUIRE TARGET(S).	.09	.02	.04	.07	.79	0	.09	0	0	.05	.86	0	.52	.29	.18
25. RECOGNIZE/IDENTIFY TARGET(S).	.09	.07	.07	.20	.55	.02	.16	.02	0	.02	.79	.02	.43	.23	.27
26. DETERMINE TARGET LOCATION BY POLAR PLOT.	.16	.18	.29	.20	.16	.02	.18	0	0	.04	.77	.02	.59	.23	.12
27. DETERMINE TARGET LOCATION BY GRID COORDINATES.	.05	0	0	.07	.86	.02	.04	0	0	.02	.91	.02	.48	.29	.18
28. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING OBSERVER/TARGET DIRECTIONS.	.12	.12	.25	.20	.29	.02	.12	0	0	.04	.82	.02	.48	.29	.18
29. DETERMINE TARGET LOCATIONS BY SHIFT FROM A KNOWN POINT USING A HORIZONTAL SHIFT.	.16	.12	.25	.16	.29	.02	.18	0	.02	.02	.75	.04	.43	.32	.16
30. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A VERTICAL SHIFT.	.25	.23	.16	.11	.23	.02	.25	0	.05	.05	.63	.02	.38	.32	.18
31. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A LATERAL SHIFT.	.16	.14	.23	.21	.25	0	.20	0	0	.04	.77	0	.43	.43	.1
32. MEASURE AN ANGLE USING THE HAND AND FINGERS.	.18	.12	.38	.12	.20	0	.20	0	0	.12	.68	0	.75	.14	.0
33. MEASURE AN ANGLE USING BINOCULARS.	.12	.02	.07	.12	.66	0	.12	0	.02	.04	.82	0	.75	.14	.0
34. MEASURE AN ANGLE USING AN AIMING CIRCLE.	.27	.36	.27	0	.11	0	.29	.02	.11	.18	.41	0	.68	.18	.0
35. MEASURE AN ANGLE USING BATTERY COMMANDER'S PERISCOPE.	.43	.32	.18	.02	.05	0	.48	0	.14	.09	.29	0	.61	.27	.0

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

E E-1 (cont.)
ASK ANALYSIS SUMMARY DATA*
ES ARE PERCENTAGES)

ULTY			TRAINING DIFFICULTY						CRITICALITY: CONSEQUENCES OF INADEQUATE PERFORMANCE						CRITICALITY: COMBAT ESSENTIAL					
DIFFICUL[T]	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE
[illegible]	.02	.04	.11	.30	.36	.18	.04	.02	.04	.04	.14	.34	.43	.02	.04	.04	.05	.23	.63	.02
[illegible]	.11	.04	.05	.09	.27	.34	.20	.05	0	.11	.34	.21	.29	.05	.05	.07	.27	.30	.25	.05
[illegible]	0	.04	.09	.16	.32	.25	.12	.05	0	.12	.25	.34	.25	.04	.05	.04	.25	.38	.25	.04
[illegible]	0	.07	.27	.36	.23	.05	.04	.05	.02	.20	.23	.34	.16	.05	.04	.12	.25	.25	.29	.05
[illegible]	0	.02	.27	.27	.34	.11	0	.02	0	.02	.07	.27	.61	.04	0	.04	0	.11	.82	.04
[illegible]	.02	.04	.09	.38	.39	.11	.02	.02	0	.02	.07	.25	[illegible]	0	0	.02	.04	.16	.79	0
	0	.05	.41	.39	.16	.02	0	.02	.05	.16	[illegible]	.25	.20	.04	.11	.11	.21	.20	.36	.02
	0	.05	.29	.38	.30	.02	0	.02	0	.04	[illegible]	.32	.52	.02	0	.02	.02	.14	.80	.02
	0	.05	.27	.36	.30	.05	0	.02	.04	.04	[illegible]	.36	.23	.02	.04	.04	.25	.18	.48	.02
	.02	.07	.25	.43	.25	.04	0	.02	.02	.05	.30	.38	.21	.04	.02	.04	.27	.21	.43	.04
[illegible]	0	.07	.23	.38	.25	.11	0	.04	.04	.18	.27	.32	.16	.04	.07	.12	.27	.18	.32	.04
	0	.04	.30	.41	.23	.02	0	.04	.02	.04	.41	.30	.20	.04	.02	.05	.30	.25	.36	.02
	0	.04	.52	.36	.07	.02	0	.04	.12	.20	.45	.12	.11	0	.11	.21	.36	.12	.18	.02
	0	.04	.55	.29	.14	0	0	.02	.02	.05	.32	.32	.29	0	.02	.07	.14	.32	.45	0
	0	.07	.23	.34	.38	.02	0	.04	.12	.11	.46	.14	.12	.04	.16	.21	.34	.14	.11	.04
	0	.05	.32	.34	.29	.02	0	.04	.23	.23	.29	.12	.09	.04	.30	.29	.20	.14	.04	.04

FORWARD OBSE
(CELL

	FREQUENCY OF PERFORMANCE DURING COMBAT EXERCISE						TIME BETWEEN JOB ENTRY AND FIRST TIME PERFORMED						TASK		
	NEVER	INFREQUENTLY	OCCASSIONALLY	OFTEN	VERY OFTEN	NO RESPONSE	NOT YET PERFORMED	MORE THAN TWO YEARS	BETWEEN ONE-TWO YEARS	BETWEEN 6 MOS-ONE YEAR	DURING FIRST SIX MONTHS	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY
36. USE DEGREES AS ANGULAR MEASUREMENTS.	.34	.43	.11	.04	.09	0	.36	.04	.05	.07	.48	0	.73	.20	.0
37. USE MILS AS ANGULAR MEASUREMENTS.	.05	0	.02	.07	.86	0	.02	.02	0	.02	.95	0	.79	.18	.0
38. DETERMINE DISTANCE BY FLASH-BANG METHOD.	.20	.30	.27	.18	.05	0	.23	.02	.02	.16	.57	0	.61	.21	.1
39. DETERMINE DISTANCE BY ESTIMATION.	.04	.04	.11	.25	.55	0	.02	.02	.04	.02	.91	00	.38	.34	.2
40. DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS.	.12	.16	.21	.29	.21	0	.12	.02	.05	.09	.71	0	.34	.45	.1
41. DETERMINE AND USE GUN-TARGET LINE AS A SPOTTING LINE.	.21	.29	.36	.09	.05	0	.29	.02	.04	.16	.50	0	.30	.34	.2
42. DETERMINE AND USE OBSERVER/TARGET LINE AS A SPOTTING LINE.	.11	.02	.07	.07	.73	0	.14	.02	0	.02	.82	0	.64	.29	.0
43. DETERMINE AND USE CARDINAL DIRECTION AS A SPOTTING LINE.	.21	.27	.25	.16	.11	0	.25	0	.05	.16	.54	0	.59	.23	.1
44. CHECK COMMUNICATIONS SYSTEMS.	.04	.02	.07	.12	.75	0	.02	0	0	.05	.93	0	.55	.27	.1
45. REPORT POSITIONS TO FDC.	.09	.05	.05	.18	.63	0	.07	0	0	.04	.88	.02	.61	.25	.1
46. OPERATE OBSERVER'S RADIO AND WIRE EQUIPMENT IN FIRE DIRECTION CHANNELS OF THE FA BATTERIES.	.05	.02	.04	.05	.82	.02	.07	0	.02	.02	.89	0	.57	.25	.1
47. USE THE CEOI TO DETERMINE CALL SIGNS, FREQUENCIES, NUMERAL CODE, AUTHENTICATION, AND ENCODING FOR THE GUIDED TEMPLATE.	.02	0	.04	.05	.88	0	0	0	0	.02	.98	0	.66	.18	.
48. USE PROPER RADIO-TELEPHONE PROCEDURES.	.04	0	0	.12	.82	.02	.02	0	0	.04	.95	0	.73	.20	.0
49. PREPARE AND TRANSMIT A CALL FOR FIRE.	.07	0	.04	.05	.82	.02	.05	0	0	.04	.91	0	.69	.23	.0
50. SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGET (FOR CANNONS).	.09	.02	.02	.21	.64	.02	.07	0	0	.02	.91	0	.68	.18	.

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

LE E-1 (cont.)
TASK ANALYSIS SUMMARY DATA*
RICS ARE PERCENTAGES)

CULTY			TRAINING DIFFICULTY						CRITICALITY: CONSEQUENCES OF INADEQUATE PERFORMANCE						CRITICALITY: COMBAT ESSENTIAL					
DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE
0	0	.05	.57	.29	.09	0	0	.05	.12	.23	.29	.16	.16	.04	.11	.25	.25	.20	.14	.05
0	0	.02	.64	.27	.09	0	0	0	.02	.05	.18	.30	.45	0	.02	.05	.07	.27	.59	0
02	0	.02	.43	.30	.25	.02	0	0	.14	.29	.43	.09	.05	0	.09	.27	.43	.12	.09	0
04	0	0	.14	.27	.39	.20	0	0	.02	.04	.32	.41	.21	0	.02	.05	.18	.39	.34	.02
05	0	.02	.11	.32	.36	.21	0	0	.04	.18	.34	.34	.11	0	.05	.14	.29	.32	.20	0
04	0	.04	.21	.38	.34	.05	0	.02	0	.14	.36	.34	.14	.02	.05	.09	.38	.30	.16	.02
02	0	.02	.52	.25	.18	.02	0	.04	0	.02	.29	.32	.36	.03	0	0	.16	.36	.46	.02
04	0	.04	.41	.29	.21	.05	0	.04	.04	.16	.41	.20	.16	.04	.05	.12	.32	.29	.18	.04
02	0	.02	.38	.25	.36	.02	0	0	0	0	.09	.23	.68	0	0	0	.07	.16	.77	0
0	0	.02	.46	.23	.27	.02	0	.02	.04	.09	.16	.32	.39	0	.02	.09	.14	.30	.45	0
02	0	.02	.39	.39	.18	.04	0	0	0	.04	.07	.29	.61	0	0	.02	.04	.21	.73	0
0	0	.02	.38	.30	.29	.04	0	0	0	0	.02	.20	.77	0	0	.02	.04	.12	.82	0
0	0	.02	.46	.27	.21	.05	0	0	0	.12	.25	.27	.36	0	0	.05	.21	.32	.41	0
0	0	.02	.39	.25	.34	.02	0	0	0	0	.21	.29	.50	0	0	.02	.07	.25	.66	0
02	.02	0	.43	.25	.29	.02	0	0	.02	.14	.25	.32	.27	0	.02	.09	.14	.29	.46	0

T
FORWARD OBSERV
(CELL E

	FREQUENCY OF PERFORMANCE DURING COMBAT EXERCISE						TIME BETWEEN JOB ENTRY AND FIRST TIME PERFORMED						TASK DI		
	NEVER	INFREQUENTLY	OCCASSIONALLY	OFTEN	VERY OFTEN	NO RESPONSE	NOT YET PERFORMED	MORE THAN TWO YEARS	BETWEEN ONE-TWO YEARS	BETWEEN 6 MOS-ONE YEAR	DURING FIRST SIX MONTHS	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT
51. SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGETS (FOR MORTARS).	.27	.07	.12	.23	.30	0	.25	.02	.02	.09	.63	0	.61	.25	.09
52. REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING SUCCESSIVE BRACKETING PROCEDURES.	.18	.09	.14	.20	.39	0	.14	0	0	.04	.82	0	.63	.20	.14
53. REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING HASTY BRACKETING PROCEDURES.	.16	.02	.02	.27	.52	0	.11	0	.02	.04	.84	0	.54	.27	.14
54. REQUEST AND ADJUST FIRE USING CREEPING PROCEDURES.	.25	30	.21	.09	.14	0	.27	0	.04	.05	.64	0	.57	.32	.07
55. CONDUCT A PRECISION REGISTRATION.	.11	.02	.20	.20	.48	0	.05	0	0	.07	.82	.04	.39	.32	.18
56. CONDUCT A FIRE MISSION AS AN AERIAL OBSERVER.	.34	.23	.29	.12	.02	0	.38	.04	.07	.14	.38	0	.23	.32	.29
57. CONDUCT A SUPPRESSIVE FIRE MISSION ON A TARGET OF OPPORTUNITY.	.09	0	.18	.23	.50	0	.09	.02	0	.04	.86	0	.50	.30	.14
58. CONDUCT A FIRE MISSION USING SHELL ILLUMINATION.	.12	.04	.11	.39	.34	0	.12	.02	0	.05	.80	0	.43	.30	.20
59. REQUEST AND ADJUST A QUICK SMOKE MISSION.	.14	.07	.25	.25	.29	0	.16	0	.05	.02	.77	0	.38	.34	.23
60. CONDUCT AN IMMEDIATE SMOKE MISSION.	.11	.07	.23	.29	.30	0	.14	.02	.04	.02	.79	0	.48	.32	.14
61. REPORT CONSEQUENCES OF FIRE-FOR-EFFECT ON TARGET.	.11	0	.05	.14	.69	0	.11	0	0	.04	.84	.02	.71	.20	.04
62. REQUEST AND ADJUST NAVAL GUN FIRE.	.89	.09	.02	0	0	0	.91	.02	0	0	.05	.02	.09	.36	.30
63. REQUEST IMMEDIATE OR PRE-PLANNED CLOSE AIR SUPPORT (CAS) STRIKES.	.43	.32	.16	.07	0	.02	.46	.04	.04	.16	.29	.02	.23	.39	.23
64. ADJUST FIRE WITHOUT AN FDC - "BLACK MAGIC"	.79	.12	.07	.02	0	0	.77	.04	0	.02	.11	.05	.11	.11	.30
65. ADJUST FIRE FOR MOVING TARGETS.	.54	.20	.12	.05	.09	0	.63	.02	0	.11	.23	.02	.20	.25	.38

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5272).

,E E-1 (cont.)
TASK ANALYSIS SUMMARY DATA*
IES ARE PERCENTAGES)

CULTY			TRAINING DIFFICULTY						CRITICALITY: CONSEQUENCES OF INADEQUATE PERFORMANCE						CRITICALITY: COMBAT ESSENTIAL					
DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE
	0	.05	.43	.38	.16	0	0	.04	.02	.11	.43	.29	.12	.04	0	.11	.29	.21	.36	.04
	0	.04	.43	.25	.30	.02	0	0	.05	.12	.23	.32	.27	0	.07	.11	.14	.21	.46	0
	.02	.04	.32	.27	.36	.05	0	0	.02	[illegible]	[illegible]	.41	.29	.02	.02	.07	.12	.29	.50	0
	0	.04	.39	.43	.14	.04	0	0	.09	.12	.27	.25	.27	0	.11	.12	.18	.25	.34	0
5	.02	.04	.23	.23	.32	.20	.02	0	.02	.04	.20	.39	.36	0	.04	.04	.25	.32	.36	0
9	.04	.04	.09	.27	.30	.23	.09	.02	0	.11	.16	.45	.25	.04	0	.16	.12	.36	.34	.02
4	0	0	.32	.27	.38	.04	0	0	.02	.02	.12	.39	.43	.02	0	0	.09	.18	.71	.02
5	0	.02	.14	.25	.48	.12	0	0	.02	.04	.25	.39	.27	.04	0	.04	.12	.36	.46	.02
4	0	.02	.18	.38	.39	.02	.04	0	.04	.04	.21	.36	.32	.04	.04	.02	.07	.29	.57	.02
4	0	.02	.23	.39	.36	.02	0	0	.04	.05	.21	.36	.30	.04	.02	.05	[illegible]	.29	.55	.02
1	.02	.02	.55	.27	.16	0	0	.02	.12	.16	.34	.21	.16	0	.02	.09	.34	.29	.23	.02
1	.02	.12	.04	.32	.30	.18	.05	.11	.04	.11	.32	.29	.18	.07	0	.07	.18	.23	.45	.07
5	.04	.05	.04	.36	.32	.16	.05	.07	.02	.05	.21	.30	.34	.07	0	.04	.11	.23	.55	.07
9	.20	.20	.05	.02	.36	.20	.18	.20	.11	.05	.27	.23	.23	.11	.12	.12	.20	.25	.16	.14
7	.05	.05	.05	.25	.36	.20	.09	.05	.02	.04	.23	.41	.29	.02	.02	.02	.11	.38	.45	.04

T
FORWARD OBSERVE
(CELL EN

	FREQUENCY OF PERFORMANCE DURING COMBAT EXERCISE						TIME BETWEEN JOB ENTRY AND FIRST TIME PERFORMED						TASK DIF		
	NEVER	INFREQUENTLY	OCCASSIONALLY	OFTEN	VERY OFTEN	NO RESPONSE	NOT YET PERFORMED	MORE THAN TWO YEARS	BETWEEN ONE-TWO YEARS	BETWEEN 6 MOS-ONE YEAR	DURING FIRST SIX MONTHS	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT
66. SEND SPOT REPORTS OF INTELLIGENCE TO BATTERY/BATTALION FDC.	.09	.07	.16	.29	.38	.02	.07	.07	.02	.05	.77	.02	.59	.29	.07
67. PERFORM CRATER AND FRAGMENT ANALYSIS.	.41	.21	.27	.04	.07	0	.43	.07	.04	.14	.30	.02	.36	.36	.18
68. CUE THE AN/MPQ-4A RADAR ON SUSPECTED SOURCES OF ENEMY INDIRECT FIRE.	.77	.16	.02	.05	0	0	.68	.16	.02	.07	.04	.04	.34	.23	.18
69. USE NIGHT OBSERVATION DEVICES.	.39	.18	.20	.11	.12	0	.45	.04	.07	.07	.38	0	.61	.23	.09

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

.E E-1 (cont.)
'ASK ANALYSIS SUMMARY DATA*
ES ARE PERCENTAGES)

:ULTY			TRAINING DIFFICULTY						CRITICALITY: CONSEQUENCES OF INADEQUATE PERFORMANCE						CRITICALITY: COMBAT ESSENTIAL					
DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE
[illegible]	0	.05	.50	.34	.14	0	0	.02	0	.05	.23	.38	.30	.04	0	0	.16	.36	.46	.02
[illegible]	0	.07	.20	.32	.43	.02	0	.04	.02	.09	.45	.27	.14	.04	0	.04	.41	.25	.27	.04
[illegible]	.05	.16	.18	.29	.21	.09	.05	.18	0	.21	.34	.21	.11	.12	.02	.09	.43	.18	.14	.14
[illegible]	0	.05	.43	.32	.21	.02	0	.02	.04	.11	.36	.32	.16	.02	0	.04	.30	.27	.38	.02

APPENDIX F: FORWARD OBSERVER TASK ANALYSIS FORM DATA - CRITICALITY BY SCENARIO

TABLE F-1

FORWARD OBSERVER/FIST CHIEF EVALUATION

CONSEQUENCES OF INADEQUATE PERFORMANCE

(CELL ENTRIES ARE PERCENT

	GENERAL						EUROPEAN						MIDD		
	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS
18. USE PHOTOGRAPHS, PHOTOMAPS OR PICTOMAPS AS A MAP SUBSTITUTE OR SUPPLEMENT.	.04	.29	.29	.18	.07	.12	.07	.18	.25	.18	.11	.21	.07	.11	.27
58. CONDUCT A FIRE MISSION USING SHELL ILLUMINATION.	.02	.04	.25	.39	.27	.04	.02	.02	.21	.36	.36	.04	.02	.02	.29
59. REQUEST AND ADJUST A QUICK SMOKE MISSION.	.04	.04	.21	.36	.32	.04	.04	.02	.20	.29	.43	.04	.04	0	.23

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT-5279)

CRITICALITY -

SCENARIO*

S)

...AST			FAR EAST						AFRICA					
SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE	NOT SERIOUS	SLIGHTLY SERIOUS	MODERATELY SERIOUS	VERY SERIOUS	EXTREMELY SERIOUS	NO RESPONSE
5	.09	.21	.05	.13	.27	.25	.09	.21	.05	.13	.25	.23	.13	.21
2	.30	.05	02	.02	.32	.36	.23	.05	.02	.05	.32	.30	.25	.05
0	.39	.04	.02	.04	.30	.27	.32	.04	.02	.02	.34	.27	.32	.04

TABLE F-2
FORWARD OBSERVER/FIST CHIEF EVALUATION

COMBAT ESSENTIAL BY SCEN

(CELL ENTRIES ARE PERCENT

	GENERAL						EUROPEAN						MIDDLE		
	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL
18. USE PHOTOGRAPHS, PHOTO-MAPS OR PICTOMAPS AS A MAP SUBSTITUTE OR SUPPLEMENT.	.07	.20	.21	.30	.11	.11	.11	.18	.20	.20	.13	.18	.11	.07	.23
58. CONDUCT A FIRE MISSION USING SHELL ILLUMINATION.	0	.04	.12	.36	.46	.02	0	.04	.13	.32	.47	.05	0	.05	.11
59. REQUEST AND ADJUST A QUICK SMOKE MISSION.	.04	.02	.07	.29	.57	.02	.04	.02	.07	.25	.61	.02	.04	.04	.07

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT-5279)

CRITICALITY -

10*

ES)

ST			FAR EAST						AFRICA					
ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NO RESPONSE
30	.11	.18	.09	.09	.27	.27	.11	.18	.09	.11	.20	.30	.13	.18
36	.36	.04	0	.07	.16	.30	.34	.04	0	.05	.18	.32	.41	.04
21	.63	.02	.04	.05	.11	.25	.55	.02	.02	.04	.13	.23	.57	.02

APPENDIX G: FORWARD OBSERVER TASK ANALYSIS FORM DATA - TASK DIFFICULTY BY SCENARIO

TABLE G-1
FORWARD OBSERVER/FIST CHIEF EVALUATION
TASK DIFFICULTY BY SCE 10*

	GENERAL						EUROPEAN						MIDDLE EA			
	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT
1. DECLINATE AN M2 COMPASS	.84	.14	.02	0	0	0	.86	.14	0	0	0	0	.70	.16	.11	.04
2. DETERMINE DIRECTION USING AN M2 COMPASS.	.82	.14	.04	0	0	0	.84	.14	.02	0	0	0	.70	.21	.05	.02
3. DETERMINE DIRECTION USING BINOCULARS AND KNOWN REFERENCES.	.68	.14	.16	0	0	0	.68	.18	.13	0	.02	0	.41	.14	.27	.14
4. CONDUCT A TERRAIN ANALYSIS.	.45	.36	.20	0	0	0	.45	.36	.14	.04	0	.02	.11	.18	.30	.30
5. READ A MILITARY MAP.	.55	.29	.13	0	0	.04	.55	.30	.11	.02	0	.02	.25	.23	.21	.2
6. ORIENT A MAP USING A COMPASS.	.84	.12	.04	0	0	0	.80	.13	.04	0	0	.04	.64	.18	.09	.04
7. ORIENT A MAP BY TERRAIN ASSOCIATION.	.43	.32	.23	.02	0	0	.45	.34	.14	.05	.02	0	.04	.27	.29	.2
8. DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION.	.14	.07	.09	.02	.68	0	.38	.38	.18	.05	0	.02	.04	.16	.30	.3
9. LOCATE AN UNKNOWN POINT ON A MAP BY RESECTION.	.55	.30	.12	.02	0	0	.59	.23	.13	.04	0	.02	.29	.25	.23	.1
10. LOCATE POINTS USING A SURVEY.	.38	.30	.20	.04	.04	.05	.39	.27	.20	.04	.04	.07	.20	.27	.27	.1
11. MEASURE GROUND DISTANCES ON A MAP.	.82	.16	.02	0	0	0	.80	.16	.02	0	0	.02	.61	.20	.16	.0
12. LOCATE AN UNKNOWN POINT ON A MAP BY INTERSECTION.	.55	.39	.04	0	0	.02	.55	.38	.04	0	0	.04	.36	.16	.36	.0
13. MAKE A MAP RECONNAISANCE.	.59	.25	.14	.02	0	0	.63	.21	.13	0	0	.04	.25	.38	.23	.1
14. PREPARE AND USE A TERRAIN SKETCH.	.61	.32	.07	0	0	0	.64	.27	.07	0	0	.02	.23	.32	.23	.0
15. USE AN FDC PREPARED VISIBILITY DIAGRAM.	.43	.25	.20	.04	0	.09	.45	.25	.18	.04	0	.09	.29	.32	.25	.0
16. CONSTRUCT A VISIBILITY DIAGRAM.	.45	.23	.21	.09	0	.02	.32	.29	.23	.13	.02	.02	.27	.21	.30	.1
17. PREPARE AND USE AN OBSERVED FIRE FAN.	.79	.18	.04	0	0	0	.82	.11	.05	0	0	.02	.68	.18	.11	.0
18. USE PHOTOGRAPHS, PHOTOMAPS OR PICTOMAPS AS A MAP SUBSTITUTE OR SUPPLEMENT.	.27	.36	.23	.05	0	.09	.30	.30	.23	.05	0	.11	.20	.29	.27	.1
19. NAVIGATE ON LAND BY FOOT.	.41	.34	.23	0	0	.02	.43	.34	.18	0	0	.04	.13	.27	.32	.2

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

T		FAR EAST						AFRICA					
EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE
0	0	.64	.21	.14	0	0	0	.61	.25	.11	.04	0	0
0	.02	.73	.18	.05	.02	0	.02	.75	.14	.05	.04	0	.02
.04	0	.39	.21	.20	.16	.04	0	.39	.13	.20	.20	.07	.04
.09	.02	.13	.29	.29	.18	.13	0	.05	.23	.38	.18	.14	.02
.04	.02	.27	.20	.25	.16	.11	.02	.18	.18	.27	.18	.18	.02
0	.05	.70	.13	.11	.02	0	.05	.68	.09	.16	0	.02	.05
.14	.02	.05	.29	.27	.23	.16	0	.04	.20	.45	.14	.16	.02
.11	.02	0	.18	.30	.32	.16	.02	.02	.11	.34	.30	.21	.02
.11	.02	.27	.23	.21	.11	.16	.02	.23	.16	.30	.11	.18	.02
.09	.07	.23	.18	.20	.18	.14	.07	.23	.18	.21	.11	.20	.07
0	.02	.57	.18	.18	.04	.02	.02	.59	.13	.20	.04	.04	.02
0	.04	.36	.25	.27	.07	.02	.04	.27	.29	.27	.27	.07	.04
0	.04	.25	.36	.21	.11	.04	04	.29	.27	.30	.14	.05	.04
.02	0	.36	.34	.18	.04	.07	.02	.32	.30	.23	.07	.05	.02
.02	.09	.30	.27	.27	.05	.02	.09	.30	.25	.25	.07	.02	.09
.05	.04	.21	.21	.29	.20	.07	.02	.21	.23	.23	.23	.07	.02
0	.04	.66	.13	.20	0	0	.02	.66	.14	.16	.04	0	.02
.04	.11	.18	.25	.25	.20	.05	.11	.18	.18	.29	.20	.05	.11
.05	.04	.07	.25	.30	.25	.09	.04	.13	.13	.39	.25	.07	.04

TABLE G-1 (cont.)

FORWARD OBSERVER/FIST CHIEF EVALUATION
TASK DIFFICULTY BY SCENARIO*

	GENERAL						EUROPEAN						MIDDLE E		
	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT
20. NAVIGATE ON LAND FROM A VEHICLE.	.41	.25	.21	.07	.02	.04	.43	.30	.16	.09	0	.02	.13	.23	.39
21. NAVIGATE ON LAND WITHOUT ANY AIDS SUCH AS A MAP OR COMPASS.	.12	.11	.36	.27	.11	.04	.11	.18	.32	.23	.11	.05	.04	.07	.14
22. SELECT AND OCCUPY OBSERVATION POSTS.	.55	.23	.16	.02	0	.04	.54	.25	.14	.04	0	.04	.29	.32	.29
23. OBSERVE FROM A TANK-MOUNTED POSITION.	.36	.29	.21	.07	0	.07	.36	.27	.18	.09	.04	.07	.34	.38	.21
24. ACQUIRE TARGET(S).	.52	.29	.18	0	0	.02	.52	.32	.13	0	.02	.02	.36	.27	.25
25. RECOGNIZE/IDENTIFY TARGET(S).	.43	.23	.27	.02	.02	.04	.43	.25	.23	.05	.02	.02	.32	.21	.32
26. DETERMINE TARGET LOCATION BY POLAR PLOT.	.59	.23	.12	0	0	.05	.57	.25	.13	0	.02	.04	.48	.21	.21
27. DETERMINE TARGET LOCATION BY GRID COORDINATES.	.48	.29	.18	0	0	.05	.48	.29	.16	0	.02	.05	.18	.32	.30
28. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING OBSERVER/TARGET DIRECTIONS.	.48	.29	.18	0	0	.05	.46	.25	.21	0	0	.05	.39	.21	.27
29. DETERMINE TARGET LOCATIONS BY SHIFT FROM A KNOWN POINT USING A HORIZONTAL SHIFT.	.43	.32	.16	0	.02	.07	.43	.34	.16	0	0	.05	.34	.34	.21
30. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A VERTICAL SHIFT.	.38	.32	.18	.05	0	.07	.35	.36	.18	.04	0	.05	.29	.27	.25
31. DETERMINE TARGET LOCATION BY SHIFT FROM A KNOWN POINT USING A LATERAL SHIFT.	.43	.43	.11	0	0	.04	.41	.43	.11	0	0	.05	.30	.36	.21
32. MEASURE AN ANGLE USING THE HAND AND FINGERS.	.75	.14	.07	0	0	.04	.79	.13	.05	0	0	.04	.75	.13	.07
33. MEASURE AN ANGLE USING BINOCULARS.	.75	.14	.07	0	0	.04	.77	.13	.07	0	0	.04	.73	.14	.07
34. MEASURE AN ANGLE USING AN AIMING CIRCLE.	.68	.18	.07	0	0	.07	.70	.16	.07	0	0	.07	.64	.20	.05
35. MEASURE AN ANGLE USING BATTERY COMMANDER'S PERISCOPE.	.61	.27	.07	0	0	.05	.64	.23	.07	0	0	.05	.57	.27	.07

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

		FAR EAST						AFRICA					
EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE
.09	.02	.07	.20	.32	.27	.11	.02	.11	.14	.38	.14	.21	.02
.39	.05	.02	.07	.18	.27	.41	.05	.02	.05	.13	.32	.43	.05
.02	.04	.23	.34	.25	.11	.04	.04	.30	.21	.34	.05	.05	.04
.02	.07	.21	.23	.21	.21	.05	.07	.25	.20	.21	.21	.05	.07
0	.02	.27	.18	.29	.18	.07	.02	.27	.16	.30	.23	.02	.02
.02	.02	.23	.20	.36	.16	.04	.02	.23	.16	.39	.18	.02	.02
0	.04	.41	.30	.20	.04	.02	.04	.39	.32	.16	.07	.02	.04
.07	.05	.20	.29	.25	.13	.09	.05	.18	.27	.29	.11	.11	.05
0	.05	.39	.25	.21	.09	0	.05	.34	.29	.20	.13	0	.05
.02	.05	.30	.34	.23	.07	0	.05	.32	.43	.18	.11	0	.05
.04	.05	.27	.34	.23	.07	0	.05	.27	.30	.18	.18	.02	.05
.02	.07	.30	.41	.16	.05	0	.07	.32	.34	.20	.07	0	.07
0	.04	.71	.14	.09	.02	0	.04	.71	.14	.09	.02	0	.04
0	.04	.75	.13	.09	0	0	.04	.70	.18	.09	0	0	.04
0	.07	.63	.18	.11	.02	0	.07	.61	.18	.13	0	0	.07
0	.05	.57	.25	.11	.02	0	.05	.55	.25	.14	0	0	.05

TABLE G-1 (cont.)

FORWARD OBSERVER/FIST CHIEF EVALUATIC
TASK DIFFICULTY BY SCENARIO*

	GENERAL						EUROPEAN						MIDDLE E		
	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT
36. USE DEGREES AS ANGULAR MEASUREMENTS.	.73	.20	.02	0	0	.05	.71	.21	.02	0	0	.05	.68	.23	.02
37. USE MILS AS ANGULAR MEASUREMENTS.	.79	.18	.02	0	0	.02	.79	.18	.02	0	0	.02	.77	.18	.02
38. DETERMINE DISTANCE BY FLASH-BANG METHOD.	.61	.21	.14	.02	0	.02	.57	.21	.16	.04	0	.02	.50	.29	.13
39. DETERMINE DISTANCE BY ESTIMATION.	.38	.34	.23	.04	0	0	.36	.34	.25	.04	0	.02	.14	.20	.32
40. DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS.	.34	.45	.14	.05	0	.02	.34	.45	.14	.05	0	.02	.16	.29	.36
41. DETERMINE AND USE GUN-TARGET LINE AS A SPOTTING LINE.	.30	.34	.29	.04	0	.04	.27	.38	.29	.04	0	.04	.29	.29	.30
42. DETERMINE AND USE OBSERVER-TARGET LINE AS A SPOTTING LINE.	.64	.29	.04	.02	0	.02	.63	.29	.05	.02	0	.02	.59	.23	.13
43. DETERMINE AND USE CARDINAL DIRECTION AS A SPOTTING LINE.	.59	.23	.11	.04	0	.04	.59	.23	.11	.02	0	.05	.46	.27	.14
44. CHECK COMMUNICATIONS SYSTEMS.	.55	.27	.14	.02	0	.02	.57	.23	.16	.02	0	.02	.54	.27	.14
45. REPORT POSITIONS TO FDC.	.61	.25	.12	0	0	.02	.61	.23	.11	.04	0	.02	.52	.20	.14
46. OPERATE OBSERVER'S RADIO AND WIRE EQUIPMENT IN FIRE DIRECTION CHANNELS OF THE FA BATTERIES.	.57	.25	.14	.02	0	.02	.55	.23	.14	.04	.02	.02	.57	.23	.18
47. USE THE CEOI TO DETERMINE CALL SIGNS, FREQUENCIES, NUMERAL CODE, AUTHENTICATION, AND ENCODING FOR THE GUIDED TEMPLATE.	.66	.18	.14	0	0	.02	.68	.18	.13	0	0	.02	.68	.16	.14
48. USE PROPER RADIO-TELEPHONE PROCEDURES.	.73	.20	.05	0	0	.02	.73	.18	.05	0	.02	.02	.73	.18	.05
49. PREPARE AND TRANSMIT A CALL FOR FIRE.	.69	.23	.05	0	0	.02	.70	.23	.04	0	.02	.02	.68	.21	.05
50. SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGET (FOR CANNONS).	.68	.18	.09	.02	.02	0	.70	.18	.09	.02	0	.02	.70	.18	.09

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

OF

T		FAR EAST						AFRICA					
EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE
0	.05	.68	.21	.05	0	0	.05	.68	.23	.04	0	0	.05
0	.02	.77	.16	.05	0	0	.02	.77	.18	.04	0	0	.02
0	.02	.45	.27	.16	.09	.02	.02	.48	.27	.14	.09	0	.02
.07	.02	.13	.14	.34	.30	.07	.02	.16	.09	.36	.29	.09	.02
.07	.02	.16	.25	.39	.11	.07	.02	.18	.23	.39	.11	.07	.02
0	.04	.21	.29	.32	.11	.04	.04	.23	.25	.30	.14	.02	.05
0	.02	.55	.25	.13	.05	0	.02	.55	.23	.14	.05	0	.02
.04	.05	.50	.16	.21	.09	0	.05	.48	.18	.21	.05	.02	.05
0	.02	.54	.25	.14	.05	0	.02	.54	.25	.14	.05	0	.02
0	.02	.46	.21	.18	.13	0	.02	.45	.18	.27	.07	.02	.02
0	.02	.63	.21	.11	.04	0	.02	.59	.25	.11	.04	0	.02
0	.02	.68	.16	.14	0	0	.02	.68	.16	.14	0	0	.02
0	.02	.75	.18	.05	0	0	.02	.73	.20	.05	0	0	.02
0	.02	.70	.23	.04	.02	0	.02	.70	.21	.07	0	0	.02
.02	.02	.7[illegible]	.16	.09	0	.02	.02	.68	.20	.09	0	.02	.02

TABLE G-1 (cont.)

FORWARD OBSERVER/FIST CHIEF EVALUATI

TASK DIFFICULTY BY SCENARIO*

	GENERAL						EUROPEAN						MIDDLE		
	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT
51. SELECT APPROPRIATE SHELL FUZE COMBINATIONS TO YIELD APPROPRIATE TERMINAL EFFECTS FOR THE ENGAGEMENT OF SELECTED TARGETS (FOR MORTARS).	.61	.25	.09	0	0	.05	.63	.23	.09	0	0	.05	.63	.23	.09
52. REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING SUCCESSIVE BRACKETING PROCEDURES.	.63	.20	.14	0	0	.04	.63	.20	.16	0	0	.02	.57	.18	.20
53. REQUEST AND ADJUST AREA FIRE (HE: Q, VT, TI, ICM) USING HASTY BRACKETING PROCEDURES.	.54	.27	.14	0	.02	.04	.55	.27	.14	0	0	.04	.46	.27	.20
54. REQUEST AND ADJUST FIRE USING CREEPING PROCEDURES.	.57	.32	.07	0	0	.04	.57	.32	.05	0	0	.05	.55	.32	.05
55. CONDUCT A PRECISION REGISTRATION.	.39	.32	.18	.05	.02	.04	.46	.25	.18	.05	.02	.04	.36	.29	.20
56. CONDUCT A FIRE MISSION AS AN AERIAL OBSERVER.	.23	.32	.29	.09	.04	.04	.13	.38	.25	.14	.05	.05	.11	.20	.38
57. CONDUCT A SUPPRESSIVE FIRE MISSION ON A TARGET OF OPPORTUNITY.	.50	.30	.14	.04	0	0	.46	.34	.13	.04	.02	.02	.36	.32	.21
58. CONDUCT A FIRE MISSION USING SHELL ILLUMINATION.	.43	.30	.20	.05	0	.02	.36	.38	.20	.05	0	.02	.38	.32	.21
59. REQUEST AND ADJUST A QUICK SMOKE MISSION.	.38	.34	.23	.04	0	.02	.36	.34	.27	.02	0	.02	.30	.32	.32
60. CONDUCT AN IMMEDIATE SMOKE MISSION.	.48	.32	.14	.04	0	.02	.43	.36	.16	.04	0	.02	.38	.36	.21
61. REPORT CONSEQUENCES OF FIRE-FOR-EFFECT ON TARGET.	.71	.20	.04	.02	.02	.02	.63	.20	.13	.02	0	.04	.61	.21	.11
62. REQUEST AND ADJUST NAVAL GUN FIRE.	.09	.36	.30	.11	.02	.12	.07	.36	.27	.13	.04	.14	.07	.34	.25
63. REQUEST IMMEDIATE OR PRE-PLANNED CLOSE AIR SUPPORT (CAS) STRIKES.	.23	.39	.23	.05	.04	.05	.21	.34	.29	.05	.04	.07	.18	.38	.27
64. ADJUST FIRE WITHOUT AN FDC - "BLACK MAGIC"	.11	.11	.30	.09	.20	.20	.14	.11	.23	.11	.20	.21	.14	.11	.20
65. ADJUST FIRE FOR MOVING TARGETS.	.20	.25	.38	.07	.05	.05	.20	.27	.32	.13	.02	.07	.13	.29	.30

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

F

		FAR EAST						AFRICA					
EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE
0	.05	.63	.20	.11	.02	0	.05	.43	.23	.09	.02	0	.05
0	.02	.55	.16	.25	.02	0	.02	.52	.20	.25	.02	0	.02
0	.04	.48	.20	.25	.02	.02	.04	.45	.27	.20	.04	.02	.04
0	.05	.57	.32	.07	0	0	.04	.54	.38	.05	0	0	.04
0	.04	.32	.27	.21	.14	0	.05	.32	.27	.23	.11	.02	.05
.14	.05	.14	.27	.29	.16	.11	.05	.16	.13	.32	.21	.13	.05
.02	.02	.41	.25	.25	.05	.02	.02	.38	.27	.23	.07	.04	.02
0	.02	.32	.29	.27	.07	.04	.02	.32	.30	.27	.05	.04	.02
.02	.02	.29	.27	.36	.07	0	.02	.29	.30	.32	.07	0	.02
.02	.02	.39	.25	.27	.05	.02	.02	.38	.27	.27	.05	.02	.02
.02	.04	.61	.21	.09	.05	0	.04	.59	.20	.13	.05	0	.04
.04	.14	.07	.32	.30	.13	.04	.14	.04	.34	.30	.13	.05	.14
.04	.07	.16	.29	.32	.11	.05	.07	.18	.27	.38	.05	.05	.07
.21	.23	.11	.09	.25	.09	.23	.23	.13	.07	.27	.09	.39	.23
.04	.07	.13	.27	.29	.20	.05	.07	.09	.30	.32	.16	.05	.07

TABLE G-1 (cont.)

FORWARD OBSERVER/FIST CHIEF EVALUATIO
TASK DIFFICULTY BY SCENARIO*

	GENERAL						EUROPEAN						MIDDLE E		
	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT
66. SEND SPOT REPORTS OF INTELLIGENCE TO BATTERY/ BATTALION FDC.	.59	.29	.07	0	0	.05	.61	.25	.07	.02	0	.05	.59	.25	.11
67. PERFORM CRATER AND FRAGMENT ANALYSIS.	.36	.36	.18	.04	0	.07	.34	.34	.21	.04	0	.05	.30	.30	.25
68. CUE THE AN/MPQ-4A RADAR ON SUSPECTED SOURCES OF ENEMY INDIRECT FIRE.	.34	.23	.18	.04	.05	.16	.34	.23	.18	.04	.05	.16	.36	.23	.16
69. USE NIGHT OBSERVATION DEVICES.	.61	.23	.0[illegible]	.02	0	.05	.57	.21	.14	.02	0	.05	.57	.21	.14

*DATA COLLECTED USING THE FORWARD OBSERVER TASK ANALYSIS FORM (PT 5279).

OF

		FAR EAST						AFRICA					
EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NO RESPONSE
0	.05	.59	.25	.11	0	0	.05	.59	.25	.11	0	0	.05
0	.07	.29	.29	.29	.07	0	.07	.30	.30	.27	.05	0	.07
.05	.16	.34	.18	.20	.07	.05	.16	.32	.21	.18	.07	.05	.16
0	.05	.57	.18	.16	.04	0	.05	.55	.21	.16	.02	0	.05

APPENDIX H: SUMMARY DATA FROM FORWARD OBSERVER QUESTIONNAIRE

TABLE
ARTILLERY OFFICER EVALUATION OF EFFECTIVENESS
(CELL ENTRIES AR

TASK	2 & 1 LT (N = 108)					CPT NO VIET NAM EXPERIENCE (N = 57)					CPT VIET NAM EXPERIENCE (N = 46)			
	INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE	INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE	INEFFECTIVE		MODERATELY EFFECTIVE	
1. USE AND REPAIR COMMUNICATION EQUIPMENT.	4	4	47	24	11	4	5	47	23	14	2	2	43	20
2. DETERMINE DIRECTION USING A COMPASS.	0	0	7	18	74	0	2	12	28	58	0	2	4	30
3. MEASURE ANGLE USING HAND AND FINGERS.	3	8	31	23	33	4	11	39	28	19	4	9	43	26
4. MEASURE ANGLE USING BINOCULARS.	3	0	6	14	75	0	5	16	30	49	4	4	11	30
5. DETERMINE DISTANCE BY FLASH-BANG METHOD.	3	9	30	22	33	11	12	40	26	11	7	4	28	24
6. DETERMINE DISTANCE BY ESTIMATION.	2	7	38	35	17	2	11	42	32	14	4	2	39	41
7. DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS.	4	16	43	28	8	2	18	37	35	7	4	7	59	24
8. PREPARE AND USE OBSERVED FIRE FAN.	0	1	13	15	70	0	2	18	46	33	7	4	30	28
9. READ AND INTERPRET A MILITARY MAP.	0	0	14	30	55	0	0	19	42	37	0	0	17	26
10. LOCATE POINTS ON A MAP.	0	0	16	31	53	0	0	18	39	42	0	0	15	33
11. DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION.	0	1	27	31	39	0	9	19	47	23	0	4	22	30
12. NAVIGATE ON LAND ON FOOT.	0	0	26	31	42	0	5	16	51	26	2	7	24	28
13. NAVIGATE ON LAND FROM VEHICLE.	0	3	26	34	36	2	12	18	47	18	0	7	35	20
14. DETERMINE TARGET LOCATION BY TERRAIN ASSOCIATION.	0	1	24	38	35	0	5	25	51	16	0	4	26	43
15. SELECT AND OCCUPY OBSERVATION POST.	1	6	20	37	35	0	16	18	30	35	2	7	30	30
16. RECOGNIZE AND IDENTIFY TARGET(S).	6	15	27	24	26	0	9	46	28	16	0	4	33	39

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283)

+TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME SUBJECTS TO RESPOND TO A PARTICULAR ITEM AND DUE

: H-1
; OF PERFORMANCE OF FORWARD OBSERVER TASKS*
E PERCENTAGES+)

	MAJ NO VIET NAM EXPERIENCE (N = 48)					MAJ VIET NAM EXPERIENCE (N = 73)					TOTAL SAMPLE (N = 332)				
VERY EFFECTIVE	INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE	INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE	INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE
24	6	4	50	4	25	1	5	45	19	25	4	5	51	21	19
63	0	2	13	23	60	1	0	11	23	64	0	1	9	23	66
15	4	8	40	21	25	11	8	36	19	19	5	9	36	23	24
50	2	0	17	25	54	1	1	22	32	40	2	2	14	24	56
35	15	10	40	10	21	10	8	26	33	19	8	9	32	24	25
13	2	2	57	27	13	3	5	32	41	18	2	6	40	36	15
2	10	8	44	23	10	3	4	45	30	12	4	11	45	28	8
24	4	4	27	29	31	3	3	19	34	36	2	2	20	28	44
57	0	4	17	27	50	0	3	12	26	59	0	1	15	30	52
52	0	2	15	31	50	0	0	12	27	60	0	0	15	32	52
43	0	6	29	33	29	0	4	15	33	48	0	5	23	34	37
37	0	8	31	25	33	0	3	18	30	49	0	4	23	33	39
37	2	4	29	27	35	0	7	16	38	37	1	6	24	34	33
28	2	4	31	35	25	0	1	22	34	42	0	3	25	40	31
30	0	10	27	31	29	1	4	26	36	26	1	8	23	34	32
22	2	2	33	38	23	0	1	23	48	26	2	8	31	34	23

O ROUNDING.

TABLE

ARTILLERY OFFICER EVALUATION OF EFFECTIVI

(CELL ENTRII

TASK	2 & 1 LT (N = 108) INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE	CPT NO VIET NAM EXPERIENCE (N = 57) INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE	CPT VIET EXPERI (N = INEFFECTIVE		MODERATELY EFFECTIVE
17. DETERMINE TARGET LOCATION BY POLAR PLOT.	0	2	17	39	42	0	4	30	35	30	2	7	15
18. DETERMINE TARGET LOCATION BY GRID COORDINATES.	0	2	23	28	46	0	4	25	44	28	0	0	15
19. PREPARE AND TRANSMIT CALL FOR FIRE.	0	1	5	21	72	0	2	19	37	40	0	0	15
20. ADJUST FIRE	1	1	8	26	62	0	0	12	47	39	0	2	13
21. REPORT POSITION TO FDC.	0	2	13	32	51	0	4	19	35	39	0	0	17

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283)

+TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME SUBJECTS TO RESPOND TO A PARTICULAR ITEM AND

(cont.)

OF PERFORMANCE OF FORWARD OBSERVER TASKS*

E PERCENTAGES+)

	MAJ NO VIET NAM EXPERIENCE (N = 48)					MAJ VIET NAM EXPERIENCE (N = 73)					TOTAL SAMPLE (N = 332)				
VERY EFFECTIVE	INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE	INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE	INEFFECTIVE		MODERATELY EFFECTIVE		VERY EFFECTIVE
28	2	0	25	35	35	1	1	27	33	34	1	2	22	37	35
41	0	0	19	42	38	0	1	16	38	42	0	2	20	37	40
39	2	0	13	17	67	0	3	7	36	53	0	1	10	30	57
50	2	2	10	35	48	0	0	5	32	60	1	1	9	33	54
50	0	4	13	31	50	0	0	10	36	51	0	2	14	33	48

TO ROUNDING.

ARTILLERY OFFICER EVALUATI
(CELL E

TASK	2 & 1 LT (N = 108) NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	CPT NO VIET NAM EXPERIENCE (N = 57) NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	V EX (NOT DIFFICULT	SLIGHTLY DIFFICULT
1. USE AND REPAIR COMMUNICATION EQUIPMENT.	26	34	24	5	1	25	26	35	4	4	37	30
2. DETERMINE DIRECTION USING A COMPASS.	68	20	10	1	0	42	33	23	2	0	61	20
3. MEASURE ANGLE USING HAND AND FINGERS.	58	26	11	3	0	51	32	12	5	0	52	35
4. MEASURE ANGLE USING BINOCULARS.	34	44	19	2	0	23	47	25	4	0	33	39
5. DETERMINE DISTANCE BY FLASH-BANG METHOD.	44	29	19	5	1	21	25	37	12	5	30	35
6. DETERMINE DISTANCE BY ESTIMATION.	6	10	37	31	16	5	5	32	40	18	9	11
7. DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS.	4	14	40	32	8	0	12	37	35	14	4	15
8. PREPARE AND USE OBSERVED FIRE FAN.	39	35	21	3	1	21	42	30	5	0	30	33
9. READ AND INTERPRET A MILITARY MAP.	10	21	43	19	6	9	21	39	19	11	15	24
10. LOCATE POINTS ON A MAP.	15	23	37	15	8	16	16	30	28	9	26	26
11. DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION.	7	17	42	22	10	5	7	32	33	19	13	11
12. NAVIGATE ON LAND ON FOOT.	9	22	38	22	6	9	16	25	39	11	13	7
13. NAVIGATE ON LAND FROM VEHICLE.	9	17	31	33	8	5	14	23	35	21	11	15
14. DETERMINE TARGET LOCATION BY TERRAIN ASSOCIATION.	10	11	40	27	11	2	11	39	37	11	7	20
15. SELECT AND OCCUPY OBSERVATION POST.	28	40	24	6	1	19	26	44	7	0	24	37
16. RECOGNIZE AND IDENTIFY TARGET(S).	7	17	37	25	12	9	19	47	16	7	11	28

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283)

+TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME SUBJECTS TO RESPOND TO A PARTICULAR ITEM

LE H-2

F DIFFICULTY OF FORWARD OBSERVER TASKS*

ES ARE PERCENTAGES+)

NAM ENCE 46)		MAJ NO VIET NAM EXPERIENCE (N = 48)					MAJ VIET NAM EXPERIENCE (N = 73)					TOTAL SAMPLE (N = 332)				
VERY DIFFICULT	EXTREMELY DIFFICULT	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT
4	0	25	29	33	2	2	27	27	37	5	0	31	34	30	4	1
0	0	54	27	17	2	0	49	33	15	1	1	56	26	16	1	0
0	0	48	38	13	2	0	49	36	12	1	0	53	32	12	2	0
2	0	38	44	17	0	2	32	34	30	4	0	32	42	23	2	0
4	2	25	38	23	10	0	29	30	26	7	7	32	30	26	7	5
37	2	6	15	48	29	2	3	19	30	27	18	5	12	36	32	13
26	0	4	21	46	19	6	3	21	36	33	8	3	16	41	30	8
2	0	23	33	29	10	2	16	37	34	8	0	27	36	29	5	1
17	4	13	15	50	21	2	8	14	45	25	7	11	19	43	20	6
7	0	21	19	40	19	2	14	15	42	22	5	17	20	38	18	6
13	7	4	17	46	25	6	4	12	30	42	11	7	13	40	28	11
26	7	8	13	52	23	4	7	10	36	34	14	9	15	38	28	8
37	4	8	13	48	21	10	4	12	34	29	10	8	14	33	31	12
30	4	4	15	60	19	0	3	11	40	33	12	6	13	42	29	9
4	0	19	31	42	8	0	8	42	40	7	0	20	36	35	7	0
13	2	6	29	35	29	0	8	32	37	18	5	8	24	39	21	7

DUE TO ROUNDING.

ARTILLERY OFFICER EVALUATI
(CELL I

TASK	2 & 1 LT (N = 108) NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	CPT NO VIET NAM EXPERIENCE (N = 57) NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	E: NOT DIFFICULT	SLIGHTLY DIFFICULT
17. DETERMINE TARGET LOCATION BY POLAR PLOT.	21	31	31	15	1	14	18	49	18	0	17	37
18. DETERMINE TARGET LOCATION BY GRID COORDINATES.	6	22	46	20	5	2	18	35	39	7	11	20
19. PREPARE AND TRANSMIT CALL FOR FIRE.	32	31	30	6	1	12	33	47	5	0	20	37
20. ADJUST FIRE	14	24	43	16	2	9	14	51	21	4	9	26
21. REPORT POSITION TO FDC.	38	29	25	5	1	28	39	28	1	0	33	35

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283)

+TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME SUBJECTS TO RESPOND TO A PARTICULAR ITEM

LE H-2 (cont.)

DIFFICULTY OF FORWARD OBSERVER TASKS*

S ARE PERCENTAGES+)

NAM NCE 16)		MAJ NO VIET NAM EXPERIENCE (N = 48)					MAJ VIET NAM EXPERIENCE (N = 73)					TOTAL SAMPLE (N = 332)				
VERY DIFFICULT	EXTREMELY DIFFICULT	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT	NOT DIFFICULT	SLIGHTLY DIFFICULT	MODERATELY DIFFICULT	VERY DIFFICULT	EXTREMELY DIFFICULT
9	4	10	35	46	8	0	16	22	45	14	3	17	28	40	13	2
17	4	10	15	52	21	2	7	12	38	33	8	7	18	44	26	5
0	0	33	29	29	8	0	19	41	32	7	0	24	34	35	5	0
22	0	13	27	46	10	2	8	22	47	18	4	11	23	45	17	2
7	0	29	33	33	2	2	27	30	32	7	1	32	32	28	4	1

DUE TO ROUNDING.

TABLE H

ARTILLERY OFFICER EVALUATION OF COMBAT ESSEN

(CELL ENTRIES

TASK	2 LT (N = [illegible])					CPT NO VIET NAM EXPERIENCE (N = 57)					CPT VIET NA EXPERIEN (N = 46			
	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY
1. USE AND REPAIR COMMUNICATION EQUIPMENT.	0	0	0	21	69	2	0	0	25	68	0	0	2	[illegible]
2. DETERMINE DIRECTION USING A COMPASS.	0	4	19	31	44	0	5	11	37	47	0	2	7	[illegible]
3. MEASURE ANGLE USING HAND AND FINGERS.	8	32	39	12	7	9	30	44	9	9	13	37	30	
4. MEASURE ANGLE USING BINOCULARS.	0	5	18	39	36	0	4	18	33	44	4	11	17	[illegible]
5. DETERMINE DISTANCE BY FLASH-BANG METHOD.	10	23	42	17	6	4	30	35	28	4	4	15	33	[illegible]
6. DETERMINE DISTANCE BY ESTIMATION.	1	4	10	40	44	0	4	19	28	49	0	0	17	[illegible]
7. DETERMINE DISTANCE BY RELATIVE APPEARANCE OF OBJECTS.	5	10	29	32	22	2	7	21	44	25	2	11	35	[illegible]
8. PREPARE AND USE OBSERVED FIRE FAN.	8	11	32	24	23	4	16	42	19	16	22	17	35	[illegible]
9. READ AND INTERPRET A MILITARY MAP.	0	0	0	4	95	0	0	0	5	93	0	0	0	
10. LOCATE POINTS ON A MAP.	0	0	2	8	87	0	0	2	16	81	0	0	0	
11. DETERMINE SELF LOCATION BY TERRAIN ASSOCIATION.	0	1	3	19	76	0	0	0	19	79	0	0	0	
12. NAVIGATE ON LAND ON FOOT.	1	5	10	21	61	0	7	7	18	67	0	0	4	
13. NAVIGATE ON LAND FROM VEHICLE.	0	0	3	16	81	2	0	2	21	74	0	0	9	
14. DETERMINE TARGET LOCATION BY TERRAIN ASSOCIATION.	0	1	3	19	77	0	0	4	28	67	0	0	2	
15. SELECT AND OCCUPY OBSERVATION POST.	2	10	20	33	33	0	4	28	32	33	0	7	24	
16. RECOGNIZE AND IDENTIFY TARGET(S).	0	0	8	26	64	0	0	11	32	54	0	0	9	

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283)

+TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME SUBJECTS TO RESPOND TO A PARTICULAR ITEM AND C

L CRITICALITY OF FORWARD OBSERVER TASKS*
E PERCENTAGES+)

	MAJ NO VIET NAM EXPERIENCE (N = 48)					MAJ VIET NAM EXPERIENCE (N = 73)					TOTAL SAMPLE (N = 332)				
EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL
67	0	0	2	25	65	0	1	4	22	70	0	0	2	24	73
61	0	0	2	38	60	0	0	10	25	66	0	2	11	32	54
11	6	35	40	17	2	16	26	36	12	8	11	32	38	12	6
30	0	8	13	46	33	7	8	26	30	27	2	7	19	37	34
20	6	25	35	23	6	[illegible]	15	44	18	16	7	[illegible]	39	21	10
35	0	2	15	48	35	0	0	11	45	42	0	2	14	41	42
11	0	10	42	33	10	0	10	25	41	[illegible]	2	10	29	37	20
7	0	8	35	35	19	5	25	32	16	18	8	15	35	23	18
96	0	0	0	8	92	0	0	0	5	95	0	0	0	5	94
89	0	0	2	8	90	0	0	1	12	86	0	0	2	11	86
91	0	0	4	17	77	0	0	1	15	84	0	0	2	15	74
87	0	2	6	29	63	0	0	7	21	73	0	3	8	20	68
80	0	0	4	29	67	0	0	7	19	73	0	0	5	19	76
72	0	0	13	21	67	0	3	5	22	68	0	1	5	22	71
35	0	4	10	35	48	1	5	26	36	30	1	7	22	34	35
72	0	0	4	27	69	0	0	7	38	55	0	0	8	29	62

O ROUNDING.

TABLE
ARTILLERY OFFICER EVALUATION OF COMBAT
(CELL ENT

	2 & 1 LT (N = 108)					CPT NO VIET NAM EXPERIENCE (N = 57)					C VIE EXPE (N		
TASK	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY
17. DETERMINE TARGET LOCATION BY POLAR PLOT.	5	17	28	25	25	2	5	30	42	19	2	7	[illegible]
18. DETERMINE TARGET LOCATION BY GRID COORDINATES.	0	0	1	12	85	0	0	0	26	74	0	0	[illegible]
19. PREPARE AND TRANSMIT CALL FOR FIRE.	0	0	9	12	77	0	0	14	21	63	0	2	[illegible]
20. ADJUST FIRE	0	0	1	6	92	0	0	4	11	84	0	0	[illegible]
21. REPORT POSITION TO FDC.	1	6	16	31	43	0	2	19	37	39	0	4	[illegible]

*DATA FROM FORWARD OBSERVER QUESTIONNAIRE (PT 5283)

+TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME SUBJECTS TO RESPOND TO A PARTICULAR ITEM A

.3 (cont.)
ENTIAL CRITICALITY OF FORWARD OBSERVER TASKS*
S ARE PERCENTAGES+)

AM NCE 6)		MAJ NO VIET NAM EXPERIENCE (N = 48)					MAJ VIET NAM EXPERIENCE (N = 73)					TOTAL SAMPLE (N = 332)				
VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL	NOT ESSENTIAL	SLIGHTLY ESSENTIAL	MODERATELY ESSENTIAL	VERY ESSENTIAL	EXTREMELY ESSENTIAL
26	26	2	17	23	27	31	1	5	23	37	33	3	11	28	31	27
20	80	0	0	2	13	85	0	0	1	21	77	0	0	1	17	81
26	65	2	2	6	23	67	0	3	11	27	58	0	1	10	20	67
13	87	0	0	0	6	94	0	0	1	7	90	0	0	1	8	90
37	48	0	6	13	27	54	0	1	11	30	53	0	4	14	32	47

UE TO ROUNDING.

APPENDIX I: LIST OF NON-FO TASKS FROM FAOBC COI AND 13F COI

TABLE I-1

Items from the FAOBC COI which are not FO tasks

Weapons & Maintenance Related Tasks

Issue fire orders and determine fire commands for area missions using fuzes quick, VT and TI in effect.

Determine adjusted TI from a precision registration with more than one lot.

Define firing battery terms.

Inspect artillery ammunition prepared for firing and supervise the care, storage, and handling of artillery ammunition.

Utilize fire commands in order to open, sustain, cease, and correct firing.

Lay an artillery weapon using the grid azimuth method.

Lay an artillery weapon using an M-2 aiming circle by the orienting angle method.

State all laying commands.

Perform following tasks on 105MM towed howitzer and the M109/M109A1 155MM SP howitzer:

a. Lay cannon for direction.
b. Perform the end for end test on the gunner's quadrant.
c. Perform the micrometer test on the gunner's quadrant.
d. Set/lay the cannon for quadrant elevation with the range quadrant.
e. Set/lay the cannon for deflection.
f. Bore sight using the distant aiming point method.
g. Perform the duties of the gunner and assistant gunner during direct firing.
h. Perform prefire checks.
i. Emplace the howitzer.
j. Follow procedures to be taken in the event of a howitzer misfire.

Perform the before, during, and after operations, checks and services on the 105MM towed howitzer and the M109/M109A1 155MM SP howitzer.

Identify all of the faults which exist on the three specified inspection items of an M561 truck; identify the procedures for the services and/or repair of three items or faults specified on M561 truck; and properly record all of the faults not already recorded.

Identify all faults, procedures for repair of faults, and record faults which cannot be corrected on the automotive system of an M109/M109A1 howitzer.

Inspect the operator maintenance of an M151 - Series truck, 2 1/2-ton truck, and a 5-ton cargo truck using preventive maintenance indicators.

Perform an Equipment Serviceability Criteria (ESC) evaluation on an M561 truck.

Determine all errors in the preparation of DD forms 314 for an M151 truck and an M109 howitzer and properly identify the procedures for inspecting the three organizational p-m-i's IAW, the organizational maintenance manual and lubrication order.

Trouble-shoot errors in the unit's repair parts system.

FIST CHIEF/LEADERSHIP TASKS

Describe hostile electronic weapons (EW) capabilities.

Describe tactical EW defensive measures.

Discuss policies associated with Gunnery Subcourse and become familiar with how to train.

Identify, explain or apply artillery fire planning terminology and techniques, fire planning channels, and requirements for higher level fire planning.

Identify and explain the tactical missions and apply the five fundamentals of organizing for combat.

Plan, plot and transmit five targets through the application of the fundamentals or company level fire planning to include use of the gridded thrust line method.

Identify the appropriate staff agency and/or individual from which one would obtain required information.

Explain the principles of fire support coordination.

State the definition and/or purpose of the various coordinating measures and identify the channels used in requesting all types of fire support.

Explain the principles of fire planning for the offense; prepare a fire plan to support an offensive operation; explain the fire planning channels for the offense.

Explain the organization and equipment of tanks, mech infantry, and combined arms units of company and battalion size; the types of offensive operations; and the elements of the plan of attack and scheme of maneuver.

Define the limits of the three defensive areas and explain the missions/actions which occur in each.

Draw, label, and interpret graphic symbols used in the defense.

Define the five military aspects of terrain.

List the five types of minefields and explain the approving authority and purpose of each.

Interpret an active defense scheme of maneuver.

Explain the four forms of defense for light artillery.

Define leadership, identify basic responsibilities, discuss traits and principles of leadership, identify the leader-follower model and identify the steps assuming a leadership posftion.

Define professionalism and ethics, identify the sources of Army standards, and identify unethical practices.

Identify the types of communications, how communication breaks down, effective listening techniques, types of counseling, indicators of cries for help, how to conduct a counseling session and pitfalls to avoid in counseling.

Discuss leadership with experienced officers and NCO's.

Describe the objectives of instruction and outline of the course, the sources of course study material; and the charactierstics of recent and future nuclear, biological and chemical defensive equipment.

Determine levels of training, formulate intermediate goals, and set standards for individual and collective training with the ARTEP and SQT manuals.

State the scope of OPSEC, describe and apply OPSEC objectives, programs, surveys, commander responsibilities, and planning guidelines.

Explain the doctrine and organization of Soviet ground forces; the capabilities, limitations and vulnerabilities of Soviet combat equipment found at division level and below; and the offensive and defensive tactics employed by Soviet regimental level.

Apply Reconnaissance, Selection, and Occupation of Position and Defense (RSOP) procedures, fundamental of defense and principles of concealment.

Define Organizational Effectiveness (OE), identify the role and function of the OESO, state the four steps of OE process, and identify OE and techniques.

Identify the role of Tactics and Combined Arms Department in FAOBC instruction.

State the purpose of the Weapons Department's instruction.

Supervise the duties of the personnel in the 105MM towed howitzer and in the M109/M109A1 155MM SP howitzer.

Supervise the performance of the before, during and after operation checks and services on the fire control and armament of the M109/M109A1 howitzer.

Inspect log book to insure all required forms are present and inspect the preparation of daily and monthly forms.

Identify all faults in battery procedures which indicate problems in publications management and recommend solutions to each problem identified.

Describe the Pershing and Lance Missile Systems to include development, characteristics, employment and major items of equipment.

FDC Tasks

Construct firing chart to standards:

a. Number grid sheet.
b. Plot and label critical points.
c. Plot and tick mark non-critical points.
d. Construct DF and AZ indices.
e. Plot fire control measures.

Determine chart range and distance.

Determine elevation and fuze setting for MTSQ and VT fuzes.

Compute vertical interval, determine it with the GST and clearance of intermediate crests.

Perform duties of personnel in the battery FDC.

Train the FDC to compute fire commands for area fire missions using quick, VT abd MTSQ fuzes.

Determine subsequent corrections based on the fire order, observer corrections and new chart data.

Determine and conduct firing data for precision registrations.

Determine correct deflection and adjusted elevation during an impact registration.

Determine total range, total fuzes, and DF correction; construct a GFT setting; determine a GFT DF correction; apply registration correction during a fire mission.

Interpret a ballistic met message to solve a concurrent met.

Determine met plus VE GFT settings.

Prepare Gun Direction Computer M18 (FADAC) for operation, operate controls, discuss program tapes, perform computer checks, detail matrix functions, determine computer outputs, compute the ballistic trajectory, use the NFA subroutine and determine firing data with computer.

Conduct Mean-Point-of-Impact (MPI) and High-Burst (HB) registrations and determine registration corrections from them.

TABLE I-2

Items from the 13F COI which are not FO tasks

Communications

Operate radio set AN/GRC 160 in the normal, remote, and secure modes.

Install the components of radio set AN/PRC 77 and prepare for operation and communicate with a monitor station.

Prepare for operation and communicate by radio set AN/PRC 77 from a remote and local position using radio set control AN/GRA 39.

Install, prepare for operation, and communicate by radio set AN/PRC 77 in the secure mode using speech security equipment TSEC/KY 38.

Carry out maintenance requirements for the radio set AN/GRC 160, radio set control AN/GRA 39, and speech security equipment TSEC/KY 38.

Operate radio set AN/VRC 47 in the normal mode.

Operate the radio set AN/VRC 49 as a retransmission station.

Install radio set AN/URC 46, prepare set for operation and communicate with a monitor station.

Install, prepare for operation and communicate by radio set AN/VRC 46 in the secure mode using speech security equipment TSEC/KY 38.

Establish a retransmission station with the radio set AN/VRC 49.

Carry out maintenance requirements for the radio sets AN/VRC46, AN/VRC47 and AN/VRC49.

Identify all components of radio intercommunication set AN/VIC 1.

Prepare and operate intercommunication set AN/VIC 1.

Carry out operator's maintenance requirements for the intercommunication set AN/VIC 1.

Install a wire line between 2 given points with the switchboard SB 993 attached to one end and the telephone set TA 312 to the other.

Construct a standard field wire splice, a T splice, road and stream crossings.

Touble-shoot a defective wire line.

Working a 4 man team, erect, disassemble and store antenna RC 292.

Construct and erect field expedient antennas in a field environment.

Install, maintain, and recover field wire.

Authenticate voice radio transmissions.

Encode and decode messages in the DRYAD numerical cipher/authentication system.

Recognize enemy jamming and deceptive measures.

Perform preventive and remedial electronic warfare procedures.

Identify the authorized and alternate radio and wire fire control communications channels.

Perform duties of the net control station.

Select call signs, suffixes, frequencies, telephone directory names and numbers and wire taggims codes

FIST NCO/Leadership

Identify the organization of a maneuver battalion down to company level, and an FA Battalion down to battery level including model and caliber.

Identify the purpose of a standard tactical mission and the inherent responsibilities of the direct support mission.

Identify the duties of the members of the FIST, the composition and organization of each type of FIST, and the methods of employment of the FIST.

Graphically portray unit symbols, maneuver control measures and fire support coordinating measures.

Prepare the staff journal, fire support situation map, fire support status chart, and fire support capabilities overlay.

FDC

Prepare an overlay.

Determine base direction.

Convert azimuths.

Determine deviation corrections.

Determine height of burst at fire for effect with FZ/Ti.

APPENDIX J: FORWARD OBSERVER TRAINING EVALUATION QUESTIONNAIRE

FORWARD OBSERVER TRAINING EVALUATION
QUESTIONNAIRE

PT5268

CTION I

As a student in the Field Artillery Officer Basic Course you have been exposed to a variety of learning experiences. This questionnaire designed to assess the extent to which you think this course has prepared you for Forward Observer duties you will perform as a Field tillery Officer. Please rate the following subject areas and provide any additional evaluative commer.· you might have.

	AMOUNT OF TRAINING	APPROPRIATENESS OF TRAINING (Did the course train to the objectives?)	EFFECTIVENESS OF PERFORMANCE (Can you perform tasks effectively?)	TYPE OF TRAINING: CLASSROOM	TYPE OF TRAINING: PRACTICAL EXERCISES	COMMENTS AND RECO[MMENDED] IMPROVEME[NTS] IN TRAINING
	TOO LITTLE / ABOUT RIGHT / TOO MUCH	VERY APPROPRIATE / MODERATELY APPROPRIATE / INAPPROPRIATE	VERY EFFECTIVE / MODERATELY EFFECTIVE / INEFFECTIVE	MORE NEEDED / SAME / LESS NEEDED	MORE NEEDED / SAME / LESS NEEDED	
Use and repair of communication equipment	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Use of compass	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Angle measurement.						
a. using hand and fingers	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
b. using binoculars	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
c. using an aiming circle, battery commander's periscope	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Determination of distance	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Use of observed fire fan	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	

	AMOUNT OF TRAINING	APPROPRIATENESS OF TRAINING (Did the course train to the objectives?)	EFFECTIVENESS OF PERFORMANCE (Can you perform tasks effectively?)	TYPE OF TRAINING: CLASSROOM	TYPE OF TRAINING: PRACTICAL EXERCICES	COMMENTS AND RE MENDED IMPROVE IN TRAINING
	TOO LITTLE / ABOUT RIGHT / TOO MUCH	VERY APPROPRIATE / MODERATELY APPROPRIATE / INAPPROPRIATE	VERY EFFECTIVE / MODERATELY EFFECTIVE / INEFFECTIVE	MORE NEEDED / SAME / LESS NEEDED	MORE NEEDED / SAME / LESS NEEDED	
Map reading						
a. read and interpret military map	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
b. locate points on map	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Land navigation						
a. on foot	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
b. from vehicle (e.g., APC, tank, etc.)	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Terrain association	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Selection and occupation of observation post	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
D. Recognition/identification of target(s)	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	

	AMOUNT OF TRAINING	APPROPRIATENESS OF TRAINING (Did the course train to the objectives?)	EFFECTIVENESS OF PERFORMANCE (Can you perform tasks effectively?)	TYPE OF TRAINING: CLASSROOM	TYPE OF TRAINING: PRACTICAL EXERCICES	COMMENTS AND RECOMMENDED IMPROVEMENTS IN TRAINING
	TOO LITTLE / ABOUT RIGHT / TOO MUCH	VERY APPROPRIATE / MODERATELY APPROPRIATE / INAPPROPRIATE	VERY EFFECTIVE / MODERATELY EFFECTIVE / INEFFECTIVE	MORE NEEDED / SAME / LESS NEEDED	MORE NEEDED / SAME / LESS NEEDED	
Determination of target location						
a. by polar plot	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
b. by grid coordinates	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Preparation and transmission of call for fire	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Responding appropriately to FDC procedures/ operations	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
Performing duties of FIST chief.						
a. technical skills	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	
b. leadership/supervisory skills	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	( ) ( ) ( ) ( ) ( )	

Please indicate source of commission.

( ) USMA ( ) OCS
( ) USNA ( ) USMC
( ) ROTC ( ) NGUS
( ) NROTC ( ) Other

Section II

1. Certain skills taught in OBC require specific prerequisite training which you may or may not have completed. List the skills taught in OBC for which prerequisite training was needed.

   a. Was this training provided prior to OBC? Give examples.

   b. Was this training provided in earlier segments of OBC? Give examples.

2. Did you encounter situations where a better understanding of basic military information would have improved your performance in FAOBC? Give examples.

3. Of the skills taught in OBC, which do you think you will use most often as a Field Artillery Officer?

Which skills, if any, do you think you will seldom or never use?

4. Please rate the adequacy of the following equipment you used in training.

	Inadequate				Adequate	Did Not Use	Recommended Changes or Improvements
a. Binoculars	( )	( )	( )	( )	( )	( )	
b. OFT	( )	( )	( )	( )	( )	( )	
c. BT-33	( )	( )	( )	( )	( )	( )	
d. Radio Sets	( )	( )	( )	( )	( )	( )	
e. Maps	( )	( )	( )	( )	( )	( )	
f. M-2 Aiming Circle	( )	( )	( )	( )	( )	( )	
g. Observed Fire Fan	( )	( )	( )	( )	( )	( )	

5. Were there any elements of forward observer training for which instruction was unnecessary or redundant?

   If so, please describe.

6. Do you feel the time spent observing someone else's performance in field exercises increased your abilities or improved your skills?

   How could one maximize the benefits from that experience?

7. If you could change any aspect of the course to improve it, what would you change and how?

8. Do you feel the examinations provided an accurate measure of your ability?

   If so, why? If not, why?

   Were the examinations learning experiences in and of themselves?

9. How would you evaluate the quality and usefulness of the texts and manuals for this course?

Which materials were most useful in the course?

Which materials were of little or no help in the course?

Are there specific forward observer skills/tasks for which additional reference materials are needed?

What are they?

10. Were you given enough information about the quality of your performance to know what you did wrong and how to improve it? Give examples.

11. Were you able to make improvements in your performance based on feedback from the instructors? Give examples.

APPENDIX K: SUMMARY DATA FROM FORWARD OBSERVER TRAINING EVALUATION QUESTIONNAIRE

TABLE K-1

STUDENT EVALUATION OF TRAINING FOR OBC 12-78, OBC 1-79 AND OBC 3-79*

(CELL ENTRIES ARE PERCENTAGES)††

TASKS / CLASS	AMOUNT OF TRAINING: TOO LITTLE		ABOUT RIGHT		TOO MUCH	APPROPRIATENESS OF TRAINING: INAPPR.		MODERATELY APPR.		VERY APPR.	EFFECTIVENESS OF PERFORMANCE: INEFF.		MODERATELY EFF.		VERY EFF.
USE AND REPAIR COMMUNICATION EQUIPMENT	24	19	51	4	1	5	8	47	27	12	3	2	34	40	19
USE COMPASS	20	15	54	6	2	6	11	45	22	13	3	5	28	36	26
MEASURE ANGLES USING HAND AND FINGERS	33	20	40	4	2	12	13	42	21	9	10	8	36	26	16
MEASURE ANGLES USING BINOCULARS	5	8	74	9	1	2	3	39	25	25	2	2	20	34	39
MEASURE ANGLES USING AIMING CIRCLE, BATTERY COMMANDER'S PERISCOPE	33	25	33	4	0	9	14	32	23	15	8	7	28	32	19
DETERMINE DISTANCE	42	29	26	3	0	14	18	35	15	15	10	10	39	31	8
USE OBSERVED FIRE FAN	7	8	78	5	0	2	5	48	18	25	1	2	28	30	36
READ AND INTERPRET MILITARY MAP	22	17	56	4	2	7	10	44	19	18	5	4	26	35	28
LOCATE POINTS ON A MAP	20	21	46	4	2	5	10	38	17	19	5	4	26	32	24
NAVIGATE ON LAND ON FOOT†	48	19	28	1	0	20	17	35	10	13	6	11	37	23	18
NAVIGATE ON LAND FROM VEHICLE	52	20	21	2	0	21	20	32	11	10	12	9	34	26	13
CONDUCT TERRAIN ASSOCIATION	29	28	39	1	0	9	14	41	18	15	6	5	32	35	19
SELECT AND OCCUPY OBSERVATION POST	30	23	43	1	1	8	16	43	18	12	8	7	41	27	14
RECOGNIZE/IDENTIFY TARGETS	25	24	47	3	0	9	13	45	17	15	7	6	37	35	15
DETERMINE TARGET LOCATION BY POLAR PLOT	12	15	69	3	0	3	6	45	25	20	1	3	31	41	24
DETERMINE TARGET LOCATION BY GRID COORDINATES	10	13	70	3	1	3	6	43	23	22	2	3	27	40	26
PREPARE AND TRANSMIT CALL FOR FIRE	9	12	74	3	1	2	5	42	25	25	2	2	27	37	31
RESPOND APPROPRIATELY TO FDC PROCEDURES/OPERATIONS	12	22	61	3	1	3	7	43	26	20	2	5	33	41	18
PERFORM TECHNICAL SKILLS OF FIST CHIEF	27	28	42	2	0	9	15	44	20	11	7	10	42	31	8
PERFORM LEADERSHIP/SUPERVISORY SKILLS OF FIST CHIEF	28	28	38	3	2	12	17	41	18	11	8	8	40	32	10

TASKS / CLASS	TYPE OF TRAINING — CLASSROOM: LESS NEEDED		SAME		MORE NEEDED	PRACTICAL EXERCISES: LESS NEEDED		SAME		MORE NEEDED
USE AND REPAIR COMMUNICATION EQUIPMENT	9	9	54	14	13	1	2	29	25	42
USE COMPASS	16	11	49	10	10	1	4	33	22	37
MEASURE ANGLES USING HAND AND FINGERS	10	7	44	19	15	2	3	32	25	35
MEASURE ANGLES USING BINOCULARS	7	9	66	10	4	1	1	51	19	24
MEASURE ANGLES USING AIMING CIRCLE, BATTERY COMMANDER'S PERISCOPE	8	8	44	18	15	1	2	22	24	46
DETERMINE DISTANCE	16	12	42	10	17	1	1	17	20	60
USE OBSERVED FIRE FAN	5	7	69	9	8	0	1	54	19	23
READ AND INTERPRET MILITARY MAP	12	10	50	12	14	1	2	31	23	40
LOCATE POINTS ON A MAP	11	11	45	12	12	1	2	23	21	42
NAVIGATE ON LAND ON FOOT†	14	13	41	10	17	2	1	23	15	53
NAVIGATE ON LAND FROM VEHICLE	14	11	37	12	20	1	2	17	17	57
CONDUCT TERRAIN ASSOCIATION	14	8	47	13	14	0	1	25	22	49
SELECT AND OCCUPY OBSERVATION POST	10	7	48	16	15	1	1	29	22	44
RECOGNIZE/IDENTIFY TARGETS	9	7	52	15	15	1	1	31	21	43
DETERMINE TARGET LOCATION BY POLAR PLOT	9	9	64	8	9	1	0	40	21	35
DETERMINE TARGET LOCATION BY GRID COORDINATES	8	9	62	9	8	1	0	38	22	34
PREPARE AND TRANSMIT CALL FOR FIRE	5	6	63	12	12	1	0	49	17	30
RESPOND APPROPRIATELY TO FDC PROCEDURES/OPERATIONS	4	5	57	14	18	1	1	43	21	32
PERFORM TECHNICAL SKILLS OF FIST CHIEF	6	6	44	21	21	0	1	27	20	48
PERFORM LEADERSHIP/SUPERVISORY SKILLS OF FIST CHIEF	6	7	41	20	23	1	2	28	22	44

*DATA FROM FORWARD OBSERVER TRAINING EVALUATION QUESTIONNAIRE (PT5268)

† DATA FOR OBC 1-79 AND OBC 3-79 ONLY

†† TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME STUDENTS TO RESPOND TO A PARTICULAR ITEM AND DUE TO ROUNDING. N FOR OBC 12-78 = 161, N FOR OBC 1-79 = 184, AND N FOR OBC 3-79 = 97.

TABLE K-2
STUDENT EVALUATION OF AMOUNT OF TRAINING*
(CELL ENTRIES ARE PERCENTAGES) ††

TASKS / CLASS	OBC 12-78 TOO LITTLE		OBC 12-78 ABOUT RIGHT		OBC 12-78 TOO MUCH	OBC 1-79 TOO LITTLE		OBC 1-79 ABOUT RIGHT		OBC 1-79 TOO MUCH	OBC 3-79 TOO LITTLE		OBC 3-79 ABOUT RIGHT		OBC 3-79 TOO MUCH	COMBINED CLASSES TOO LITTLE		COMBINED CLASSES ABOUT RIGHT		COMBINED CLASSES TOO MUCH
USE AND REPAIR COMMUNICATION EQUIPMENT	23	21	51	4	0	20	19	55	2	2	31	15	46	0	6	24	19	51	4	1
USE COMPASS	15	14	63	5	2	17	19	52	6	3	33	12	43	2	8	20	15	54	6	2
MEASURE ANGLES USING HAND AND FINGERS	34	26	33	4	0	27	20	47	2	2	39	11	40	3	5	33	20	40	4	2
MEASURE ANGLES USING BINOCULARS	4	11	75	6	0	4	4	80	8	1	8	10	64	1	14	5	8	74	9	1
MEASURE ANGLES USING AIMING CIRCLE, BATTERY COMMANDER'S PERISCOPE	31	28	32	2	0	33	22	35	6	1	36	23	31	0	6	33	25	33	4	0
DETERMINE DISTANCE	37	35	24	3	0	37	30	31	1	0	59	15	19	1	5	42	29	26	3	0
USE OBSERVED FIRE FAN	5	11	78	3	0	7	6	80	6	0	8	5	77	1	7	7	8	78	5	0
READ AND INTERPRET MILITARY MAP	23	20	53	4	1	21	38	58	3	0	22	10	56	4	4	22	17	56	4	2
LOCATE POINTS ON A MAP	23	23	40	5	0	16	24	50	2	2	19	10	53	5	4	20	21	66	4	2
NAVIGATE ON LAND ON FOOT †						42	22	30	2	0	58	14	25	0	0	48	19	28	1	0
NAVIGATE ON LAND FROM VEHICLE	55	18	19	2	1	45	22	24	3	0	57	20	19	0	0	52	20	21	2	0
CONDUCT TERRAIN ASSOCIATION	25	33	39	0	0	24	31	40	2	0	46	13	37	1	1	29	28	39	1	0
SELECT AND OCCUPY OBSERVATION POST	32	27	36	2	1	29	20	47	0	2	29	19	48	0	0	30	23	43	1	1
RECOGNIZE/IDENTIFY TARGETS	23	26	49	3	0	22	27	45	5	0	34	14	47	1	1	25	24	47	3	0
DETERMINE TARGET LOCATION BY POLAR PLOT	7	17	72	3	0	13	12	70	4	0	21	14	61	1	3	2	5	69	3	0
DETERMINE TARGET LOCATION BY GRID COORDINATES	8	16	71	1	0	7	9	72	6	2	16	15	3	2	3	10	13	70	3	1
PREPARE AND TRANSMIT CALL FOR FIRE	10	14	73	2	0	7	8	79	3	2	11	14	69	1	3	9	12	74	3	1
RESPOND APPROPRIATELY TO FDC PROCEDURES/OPERATIONS	12	24	60	3	0	11	17	66	4	2	15	26	57	0	2	12	22	61	3	1
PERFORM TECHNICAL SKILLS OF FIST CHIEF	26	25	47	2	0	24	35	36	4	0	34	23	42	0	1	27	28	42	2	0
PERFORM LEADERSHIP/SUPERVISORY SKILLS OF FIST CHIEF	23	28	42	2	2	27	29	37	4	2	37	23	35	2	3	28	28	38	3	2

*DATA FROM FORWARD OBSERVER TRAINING EVALUATION QUESTIONNAIRE (PT5268)
†ITEM NOT INCLUDED IN OBC 12-78 QUESTIONNAIRE ADMINISTRATION
††TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME STUDENTS TO RESPOND TO A PARTICULAR ITEM AND DUE TO ROUNDING.
N FOR OBC 12-78 = 161, N FOR OBC 1-79 = 184, AND N FOR OBC 3-79 = 97

TABLE K-3
STUDENT EVALUATION OF APPROPRIATENESS OF TRAINING*
(CELL ENTRIES ARE PERCENTAGES)††

CLASS / TASKS	OBC 12-78					OBC 1-79					OBC 3-79					COMBINED CLASSES				
	APPRO.		MODER-ATELY APPRO.		VERY APPRO.	APPRO.		MODER-ATELY APPRO.		VERY APPRO.	APPRO.		MODER-ATELY APPRO.		VERY APPRO.	APPRO.		MODER-ATELY APPRO.		VERY APPRO.
USE AND REPAIR COMMUNICATION EQUIPMENT	4	7	45	30	13	5	11	42	29	12	5	6	57	18	11	5	8	47	27	12
USE COMPASS	4	10	47	25	10	5	11	43	20	17	12	12	41	19	13	6	11	45	22	13
MEASURE ANGLES USING HAND AND FINGERS	10	13	42	21	9	11	12	45	21	9	15	16	35	21	8	12	13	42	21	9
MEASURE ANGLES USING BINOCULARS	2	3	35	25	28	1	3	41	23	29	2	3	44	31	15	2	3	39	25	25
MEASURE ANGLES USING AIMING CIRCLE, BATTERY COMMANDER'S PERISCOPE	16	15	26	23	17	8	14	33	25	15	8	11	41	20	12	9	14	32	23	15
DETERMINE DISTANCE	11	22	33	19	14	12	13	42	15	15	23	20	29	9	17	14	18	35	15	15
USE OBSERVED FIRE FAN	2	5	48	20	23	2	4	48	20	24	2	5	49	11	50	2	5	48	18	25
READ AND INTERPRET MILITARY MAP	4	13	40	23	18	6	6	49	16	22	11	9	44	19	13	7	10	44	19	18
LOCATE POINTS ON A MAP	4	11	36	20	18	4	8	36	18	32	9	10	46	11	13	5	10	38	17	19
NAVIGATE ON LAND ON FOOT †						16	17	38	11	12	28	16	31	7	13	20	17	35	10	13
NAVIGATE ON LAND FROM VEHICLE	22	21	31	15	5	17	17	35	11	15	25	25	28	4	12	21	20	32	11	10
CONDUCT TERRAIN ASSOCIATION	5	16	40	23	13	7	12	42	16	19	19	13	40	11	13	9	14	41	18	15
SELECT AND OCCUPY OBSERVATION POST	8	17	41	20	10	8	17	40	17	15	9	10	52	15	10	8	16	43	18	12
RECOGNIZE/IDENTIFY TARGETS	8	13	46	18	14	9	12	40	18	18	10	14	48	12	12	9	13	45	17	15
DETERMINE TARGET LOCATION BY POLAR PLOT	3	7	48	26	16	2	4	49	29	24	4	7	48	18	22	3	6	45	25	20
DETERMINE TARGET LOCATION BY GRID COORDINATES	3	7	48	22	18	2	4	33	30	27	4	7	49	14	24	3	6	43	23	22
PREPARE AND TRANSMIT CALL FOR FIRE	1	5	44	28	20	1	2	38	37	30	6	6	46	14	25	2	5	42	25	25
RESPOND APPROPRIATELY TO FDC PROCEDURES/OPERATIONS	2	4	47	27	18	3	6	38	28	24	6	12	45	19	16	3	7	43	26	20
PERFORM TECHNICAL SKILLS OF FIST CHIEF	8	11	48	22	10	10	20	36	19	12	11	12	49	16	10	9	15	44	20	11
PERFORM LEADERSHIP/SUPERVISORY SKILLS OF FIST CHIEF	10	15	47	20	8	11	20	37	18	12	16	16	38	14	13	12	17	41	18	11

*DATA FROM FORWARD OBSERVER TRAINING EVALUATION QUESTIONNAIRE (PT5268)
†ITEM NOT INCLUDED IN OBC 12-78 QUESTIONNAIRE ADMINISTRATION
††TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME STUDENTS TO RESPOND TO A PARTICULAR ITEM AND DUE TO ROUNDING.
N FOR OBC 12-78 = 161, N FOR OBC 1-79 = 104, AND N FOR OBC 3-79 = 97.

TABLE K-4
STUDENT EVALUATION OF EFFECTIVENESS OF PERFORMANCE*
(CELL ENTRIES ARE PERCENTAGES) ††

TASKS / CLASS	OBC 12-78 INEFFEC. †	OBC 12-78 MODERATELY EFFEC.		OBC 12-78 VERY EFFEC.	OBC 1-79 INEFFEC.		OBC 1-79 MODERATELY EFFEC.		OBC 1-79 VERY EFFEC.	OBC 3-79 INEFFEC.		OBC 3-79 MODERATELY EFFEC.		OBC 3-79 VERY EFFEC.	COMBINED CLASSES INEFFEC.		COMBINED CLASSES MODERATELY EFFEC.		COMBINED CLASSES VERY EFFEC.
USE AND REPAIR COMMUNICATION EQUIPMENT	4	30	49	16	3	5	37	34	19	3	3	34	36	23	3	2	34	40	19
USE COMPASS	3	26	45	23	1	6	34	32	24	6	10	25	24	33	3	5	28	36	26
MEASURE ANGLES USING HAND AND FINGERS	12	39	32	13	6	12	38	25	18	14	15	27	19	22	10	8	36	26	16
MEASURE ANGLES USING BINOCULARS	2	16	43	34	1	0	25	26	44	2	3	21	29	41	2	2	20	34	39
MEASURE ANGLES USING AIMING CIRCLE, BATTERY COMMANDER'S PERISCOPE	10	27	38	20	6	12	31	27	18	6	9	26	31	21	8	7	28	32	19
DETERMINE DISTANCE	10	44	36	8	7	17	35	31	7	15	18	35	23	8	10	10	39	31	8
USE OBSERVED FIRE FAN	0	27	41	28	1	3	29	26	39	2	5	29	15	49	1	2	28	30	36
READ AND INTERPRET MILITARY MAP	6	20	50	22	2	8	32	24	32	5	4	26	29	33	5	4	26	35	28
LOCATE POINTS ON A MAP	7	22	42	18	4	7	30	25	26	3	7	29	23	29	5	4	26	32	24
NAVIGATE ON LAND ON FOOT †					6	13	37	24	16	6	8	38	23	22	6	11	37	23	18
NAVIGATE ON LAND FROM VEHICLE	21	34	29	9	5	19	30	27	14	6	11	41	16	20	12	9	34	26	13
CONDUCT TERRAIN ASSOCIATION	8	29	46	15	4	7	33	27	25	6	10	36	28	18	6	5	32	35	19
SELECT AND OCCUPY OBSERVATION POST	13	42	28	15	5	16	37	27	12	3	7	44	26	18	8	7	41	27	14
RECOGNIZE/IDENTIFY TARGETS	10	34	41	15	5	11	36	34	13	5	8	43	25	18	7	6	37	35	15
DETERMINE TARGET LOCATION BY POLAR PLOT	1	28	53	17	1	4	32	34	28	2	7	33	28	30	1	3	31	41	24
DETERMINE TARGET LOCATION BY GRID COORDINATES	2	24	52	19	1	4	27	34	29	2	7	33	26	32	2	3	27	40	26
PREPARE AND TRANSMIT CALL FOR FIRE	2	27	45	26	1	3	28	31	35	3	4	26	30	36	2	2	27	37	31
RESPOND APPROPRIATELY TO FDC PROCEDURES/OPERATIONS	2	33	52	13	2	8	34	33	22	4	8	33	33	22	2	5	33	41	18
PERFORM TECHNICAL SKILLS OF FIST CHIEF	7	45	40	8	6	23	23	20	8	9	7	40	33	9	7	10	42	31	8
PERFORM LEADERSHIP/SUPERVISORY SKILLS OF FIST CHIEF	9	39	48	6	7	16	43	21	10	9	8	38	26	18	8	8	40	32	10

*DATA FROM FORWARD OBSERVER TRAINING EVALUATION QUESTIONNAIRE (PT5268)
†ITEM NOT INCLUDED IN OBC 12-78 QUESTIONNAIRE ADMINISTRATION
††TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME STUDENTS TO RESPOND TO A PARTICULAR ITEM AND DUE TO ROUNDING.
N FOR OBC 12-78 = 161, N FOR OBC 1-79 = 184, AND N FOR OBC 3-79 = 97.

TABLE K-5
STUDENT EVALUATION OF AMOUNT OF CLASSROOM TRAINING*
(CELL ENTRIES ARE PERCENTAGES)††

TASKS / CLASS	OBC 12-78 LESS NEEDED		OBC 12-78 SAME		OBC 12-78 MORE NEEDED	OBC 1-79 LESS NEEDED		OBC 1-79 SAME		OBC 1-79 MORE NEEDED	OBC 3-79 LESS NEEDED		OBC 3-79 SAME		OBC 3-79 MORE NEEDED	COMBINED CLASSES LESS NEEDED		COMBINED CLASSES SAME		COMBINED CLASSES MORE NEEDED
USE AND REPAIR COMMUNICATION EQUIPMENT	9	10	55	15	10	9	11	56	11	12	8	5	51	5	18	9	9	54	14	13
USE COMPASS	15	11	51	11	8	14	12	50	7	12	21	9	43	12	11	16	11	49	10	10
MEASURE ANGLES USING HAND AND FINGERS	8	10	36	24	16	17	7	53	13	11	13	2	41	18	21	10	7	44	19	15
MEASURE ANGLES USING BINOCULARS	7	10	63	10	3	4	9	75	5	4	10	5	56	19	7	7	9	66	10	4
MEASURE ANGLES USING AIMING CIRCLE, BATTERY COMMANDER'S PERISCOPE	8	9	42	17	15	8	9	47	18	12	9	4	42	21	19	8	8	14	18	15
DETERMINE DISTANCE	15	9	46	11	14	12	16	45	6	19	24	9	30	13	21	16	12	42	10	17
USE OBSERVED FIRE FAN	4	7	68	13	5	7	6	72	6	9	5	9	65	7	11	65	7	69	9	8
READ AND INTERPRET MILITARY MAP	13	11	48	11	15	10	10	50	13	16	12	7	57	10	8	12	10	50	12	14
LOCATE POINTS ON A MAP	11	11	40	13	13	9	11	49	11	12	15	8	47	9	8	11	11	45	12	12
NAVIGATE ON LAND ON FOOT †						11	15	42	11	17	20	9	39	8	16	14	13	41	10	17
NAVIGATE ON LAND FROM VEHICLE	13	9	38	13	20	10	16	37	12	21	21	9	33	10	20	14	11	37	12	20
CONDUCT TERRAIN ASSOCIATION	13	9	49	14	1	11	12	44	14	16	23	2	46	9	14	14	8	47	13	14
SELECT AND OCCUPY OBSERVATION POST	10	8	43	22	41	9	11	48	11	20	11	2	56	11	11	10	7	48	16	15
RECOGNIZE/IDENTIFY TARGETS	9	7	57	19	13	8	8	52	15	16	11	4	55	7	18	9	7	52	15	15
DETERMINE TARGET LOCATION BY POLAR PLOT	8	11	62	10	7	6	8	68	9	8	13	6	64	2	13	9	9	64	8	9
DETERMINE TARGET LOCATION BY GRID COORDINATES	7	11	58	11	7	6	9	64	7	7	14	3	59	8	12	8	9	62	9	8
PREPARE AND TRANSMIT CALL FOR FIRE	5	4	63	11	18	2	9	65	15	7	8	4	60	9	16	5	6	63	12	12
RESPOND APPROPRIATELY TO FDC PROCEDURES/OPERATIONS	4	7	53	15	19	2	4	65	14	12	6	2	52	13	26	4	5	57	14	18
PERFORM TECHNICAL SKILLS OF FIST CHIEF	5	7	46	21	22	5	7	42	24	20	9	1	48	18	22	6	6	44	21	21
PERFORM LEADERSHIP/SUPERVISORY SKILLS OF FIST CHIEF	6	8	36	21	23	5	6	40	24	23	8	5	51	11	23	66	7	41	20	23

*DATA FROM FORWARD OBSERVER TRAINING EVALUATION QUESTIONNAIRE (PT5268)
†ITEM NOT INCLUDED IN OBC 12-78 QUESTIONNAIRE ADMINISTRATION
††TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME STUDENTS TO RESPOND TO A PARTICULAR ITEM AND DUE TO ROUNDING.
N FOR OBC 12-78 = 151, N FOR OBC 1-79 = 184, AND N FOR OBC 3-79 = 97.

TABLE K-6
STUDENT EVALUATION OF AMOUNT OF PRACTICAL EXERCISES*
(CELL ENTRIES ARE PERCENTAGES)††

TASKS / CLASS	OBC 12-78					OBC 1-79					OBC 3-79					COMBINED CLASSES				
	LESS NEEDED		SAME		MORE NEEDED	LESS NEEDED		SAME		MORE NEEDED	LESS NEEDED		SAME		MORE NEEDED	LESS NEEDED		SAME		MORE NEEDED
USE AND REPAIR COMMUNICATION EQUIPMENT	1	1	30	28	38	1	3	29	27	39	1	0	26	15	55	1	2	29	25	42
USE COMPASS	5	3	38	24	32	1	5	32	24	34	2	3	25	15	53	1	4	33	22	37
MEASURE ANGLES USING HAND AND FINGERS	2	2	26	33	33	0	1	41	21	34	5	3	27	15	43	2	2	32	25	35
MEASURE ANGLES USING BINOCULARS	5	2	48	23	22	0	0	60	17	19	2	0	41	13	38	1	1	51	19	24
MEASURE ANGLES USING AIMING CIRCLE, BATTERY COMMANDER'S PERISCOPE	2	2	20	24	47	1	2	23	27	42	1	1	23	18	51	1	2	22	24	46
DETERMINE DISTANCE	6	2	18	20	59	1	0	16	26	55	1	2	14	10	70	1	1	17	20	60
USE OBSERVED FIRE FAN	0	3	52	21	22	0	0	58	19	22	2	1	54	15	26	0	1	54	19	23
READ AND INTERPRET MILITARY MAP	0	2	32	24	38	1	1	31	25	40	3	2	31	16	43	1	2	31	23	40
LOCATE POINTS ON A MAP	0	2	22	21	42	0	1	23	27	41	3	1	27	13	44	1	2	23	21	42
NAVIGATE ON LAND ON FOOT †						1	1	23	19	50	4	0	24	7	60	2	1	23	15	53
NAVIGATE ON LAND FROM VEHICLE	2	1	16	22	53	0	3	18	15	58	1	1	19	9	64	1	2	17	17	57
CONDUCT TERRAIN ASSOCIATION	0	2	27	22	46	0	0	25	27	43	1	0	22	10	63	0	1	25	22	49
SELECT AND OCCUPY OBSERVATION POST	0	2	24	26	45	1	0	30	23	42	1	1	34	15	44	1	1	29	22	44
RECOGNIZE/IDENTIFY TARGETS	0	1	30	23	45	1	0	34	24	38	1	3	30	14	48	1	1	31	21	43
DETERMINE TARGET LOCATION BY POLAR PLOT	1	0	35	27	33	0	0	44	23	31	3	0	40	9	46	1	0	40	21	35
DETERMINE TARGET LOCATION BY GRID COORDINATES	0	0	32	26	34	0	0	43	23	28	3	0	39	11	43	1	0	38	22	34
PREPARE AND TRANSMIT CALL FOR FIRE	0	0	44	18	32	1	0	55	20	22	2	0	47	9	38	1	0	49	16	30
RESPOND APPROPRIATELY TO FDC PROCEDURES/OPERATIONS	0	0	42	20	34	0	1	48	26	23	3	0	39	13	43	1	1	43	21	32
PERFORM TECHNICAL SKILLS OF FIST CHIEF	0	3	28	21	42	0	0	24	24	50	1	0	28	14	56	0	1	27	20	48
PERFORM LEADERSHIP/SUPERVISORY SKILLS OF FIST CHIEF	1	4	29	22	38	1	0	25	26	46	1	1	29	13	55	1	2	28	22	44

*DATA FROM FORWARD OBSERVER TRAINING EVALUATION QUESTIONNAIRE (PT5268)
†ITEM NOT INCLUDED IN OBC 12-78 QUESTIONNAIRE ADMINISTRATION
††TOTAL PERCENTAGES MAY DEVIATE FROM 100 DUE TO FAILURE OF SOME STUDENTS TO RESPOND TO A PARTICULAR ITEM AND DUE TO ROUNDING. N FOR OBC 12-78 = 161, N FOR OBC 1-79 = 184, AND N FOR OBC 3-79 = 97.